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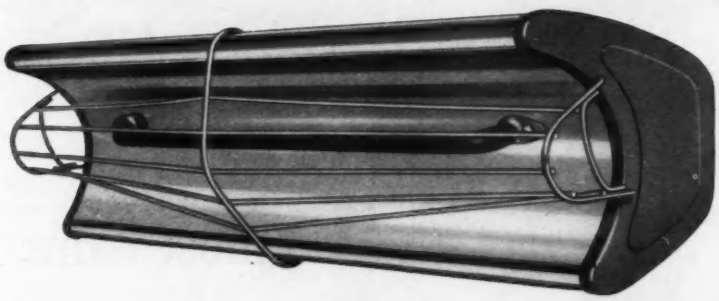

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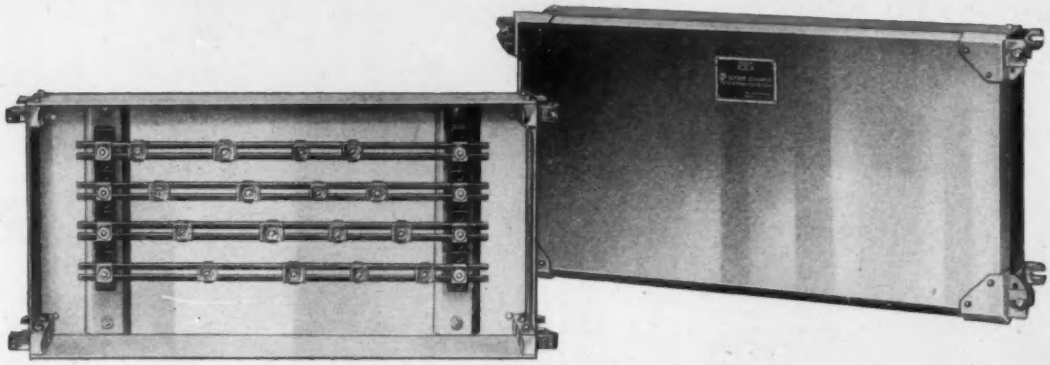

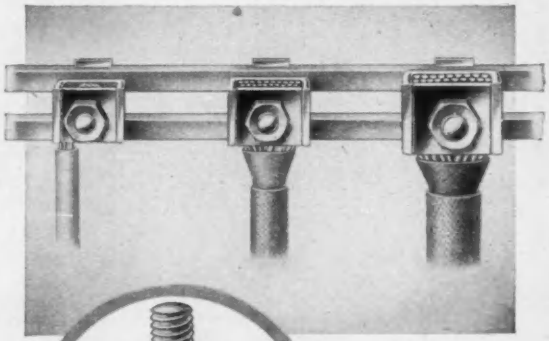

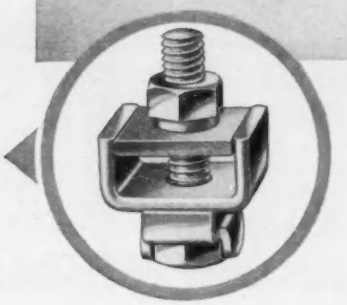

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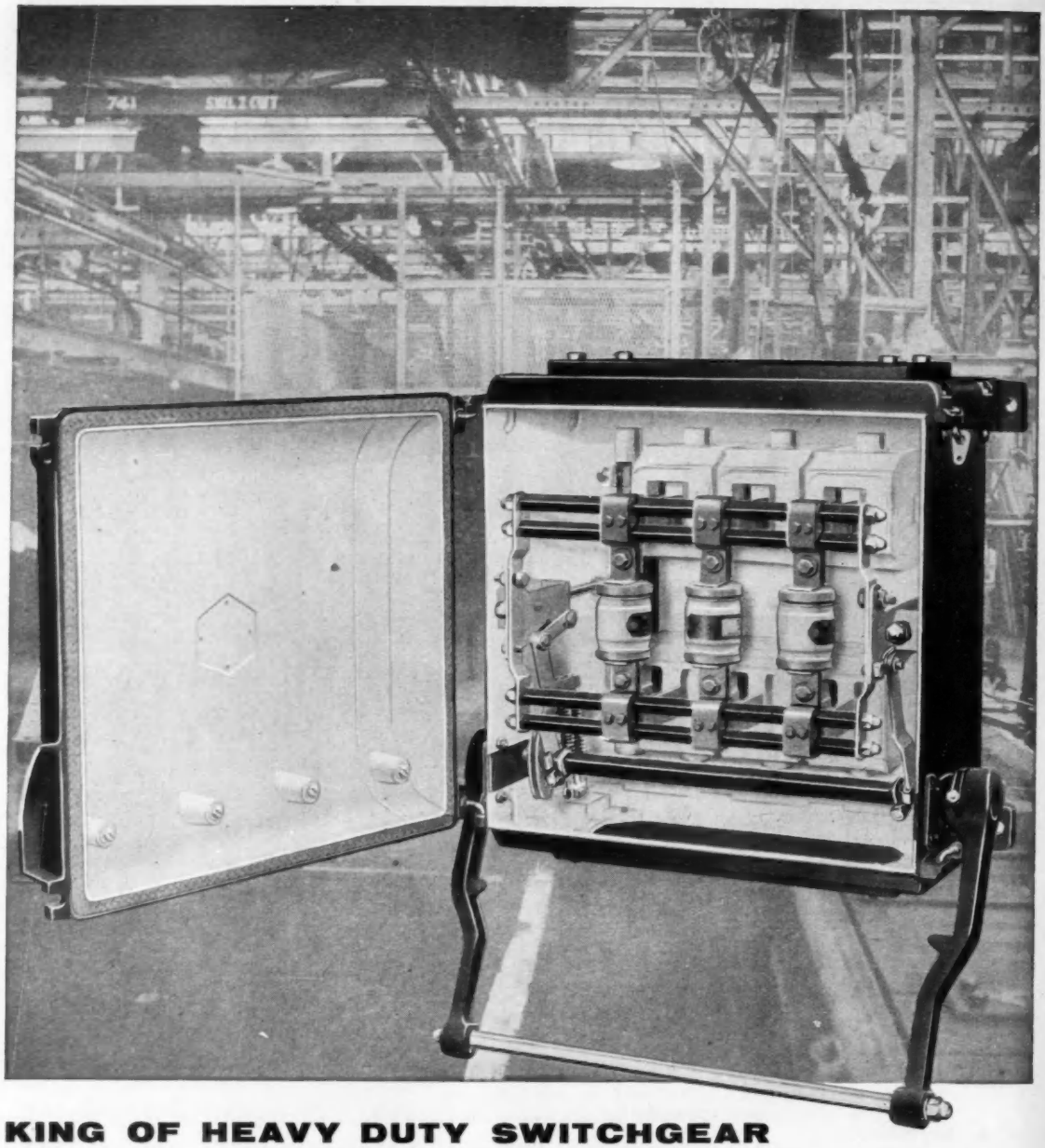

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MEM 'GLASGOW-REX' H.R.C.

THERE MUST BE few electrical engineers anywhere in the world who are not familiar with the "Glasgow-Rex" Switches and Fused Switches. The world-wide reputation gained by this range is well deserved. The quality is superlative.

Designed for heavy duty on large power and lighting installations "Glasgow-Rex" is available in ratings from 30 to 300 amps, 500 volts, in D.P., T.P., and T.P.N. patterns.

The fuse switches are fitted with "Kantark" H.R.C. Cartridge Fuse Links rated at the carrying capacity of the switch, and will clear the heaviest fault currents without risk of damage.

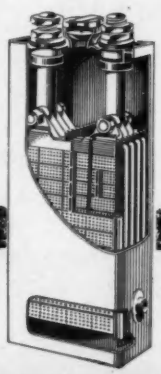
Bearing in mind that H.R.C. Cartridge Fuse Links are included, prices are most highly competitive.

Send for List No. 340 describing the "Glasgow-Rex" and other M.E.M. switchgear.

WHAT'S NEW ABOUT NIFE SWITCH TRIPPING UNITS?

The design is, for a start. The fascia panel, with its flush-fitting rectangular meters, is particularly clean and uncluttered. The inclusion of a high-rate charge indicating light is without precedent. Inspection of batteries has been simplified by putting them in *one* tier. The useful space at the bottom of the cabinet is just the place for tools. Finally, the cost is new. No, it isn't more but *less* than that of the former model. Now—

What's old about Nife Switch Tripping Units? Their reliability! Like the previous 12,500 models which are in service throughout the world, these new units are steelclad, self-contained and powered by the Nife steel battery. The battery that's free from self-discharge; the battery that won't corrode. The battery, in short, that *never* lets you down.



The Nife Switch Tripping Unit can be used, in addition, for any other application involving intermittent discharges. You'd like to know more about it?

Write for Publication No. 2751/A

NIFE BATTERIES · REDDITCH · WORCESTERSHIRE

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This outstanding development in lighting equipment by the manufacturers of the world renowned THORLUX range of lighting fittings will be specially welcome to those industries suffering from the effect of chemically laden atmosphere on metal parts.

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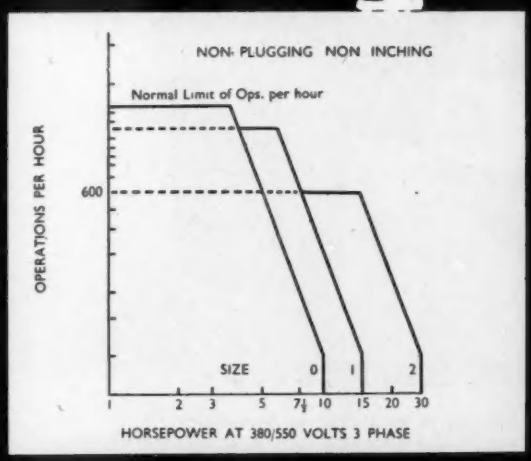

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- Twin-break, heavy-duty, sintered silver contacts are vertically mounted and so 'dust-safe'. They never need filing or cleaning.
- Ample arc rupturing capacity is effected by special design of totally enclosed arc chambers.
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A.C. RATING UP TO 30 H.P. NOW, UP TO 100 H.P. SHORTLY.

Can be provided with D.C. operating magnet.

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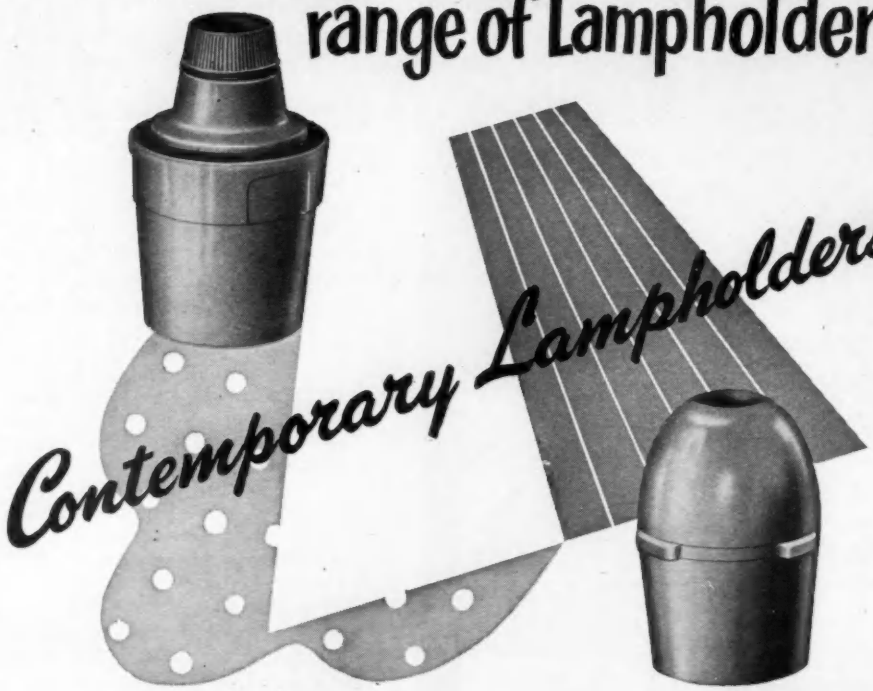

for Contemporary Lighting Schemes . . .

For the first time a really contemporary design is available in domestic lampholders. Making a radical departure from traditional styling Nettle have produced these attractive fittings in White, Black and Dove Grey. The variety of interiors includes the well-known coarse-threaded porcelain.

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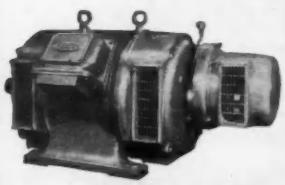
Before you choose a motor, consider what Harland offer—a comprehensive range of A.C. and D.C. machines of small and large power ratings, for all standard voltages and for vertical and horizontal mounting. For example the M range of machines are squirrel cage or slip ring motors from 30 to 400 h.p. and the 'AV' range for outputs of 350-3,000 h.p. An outstanding characteristic of the D.C. range is the excellent commutation and high efficiency with consequent low maintenance and running costs. Each brush holder is adjustable and a compact tensioning arrangement is provided. The range covers 20 to 2000 h.p. 200 to 500 volts.

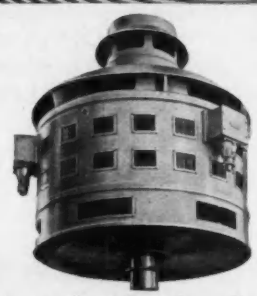
Screen protected, splash-proof, drip-proof and all other standard enclosures can be provided. There are also ranges of water-cooled motors, submersible motors, and special high efficiency motors, for continuous running.

We invite you to write for our descriptive literature.

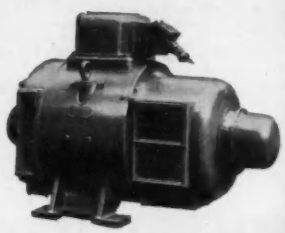
HARLAND MOTORS



'M' type A.C. squirrel cage or slip ring motors. Publication No. B.310



A vertical spindle A.C. machine from the 'AV' range. Publication No. B.330.



A typical D.C. machine from the comprehensive range available in all types of enclosures. Publication No. B.320.

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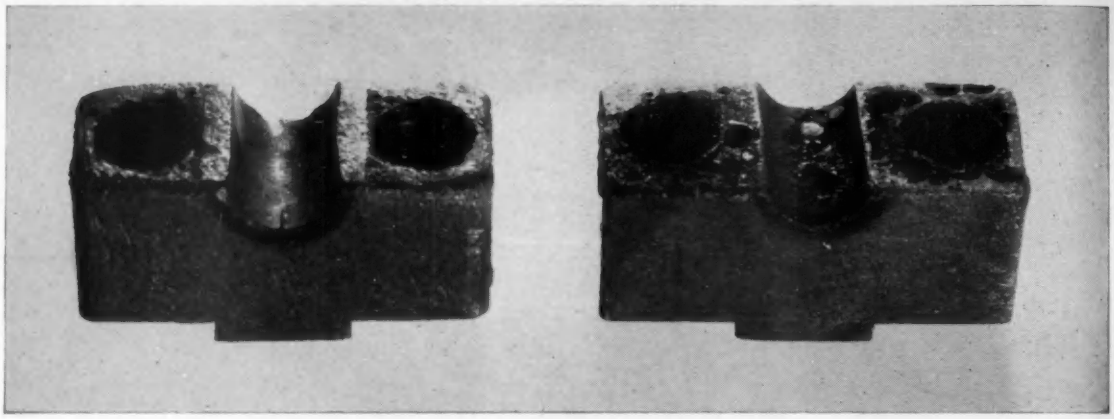
Copelmet 'PW': 150,000 flash butt welds **Cadmium Copper: 1,000 flash butt welds**



THESE TWO RESISTANCE WELDING ELECTRODES

have been used for the flash butt welding of ·45% carbon steel to austenitic steel stems in the manufacture of motor car engine valves.

The die on the right is of cadmium copper alloy and lasted for approximately one day, completing only 1,000 welds before reaching end-of-life condition. The die on the left has an insert of COPELMET 'PW', and has made 150,000 welds.

These dies were photographed exactly as removed from the machine without any cleaning up or treatment of any kind, and *the photograph is absolutely unretouched.*

The superiority of COPELMET is obvious. It is a product of powder metallurgy: it is not an alloy and does not derive its properties from heat treatment or cold working. These and other advantages of COPELMET were discussed in a previous article in this series (copies of which are available on request—please ask for Publication MC/IER). In that article, the use of COPELMET as a facing for projection welding dies was discussed, and its advantages were summarized as follows:

Hardness of 230-250 VPN retained up to a much higher temperature than Copper base alloys

Electrical conductivity 38% of Copper

Low thermal expansion

High resistance to erosion by burning

It will be readily apparent that those same properties can equally well be made use of in other resistance welding processes. In addition to projection welding and flash butt welding, COPELMET electrodes are used for electrical upsetting, hot rivetting and, in some special cases, spot welding.

It should, however, be emphasised that COPELMET is not a substitute for copper-base alloys for spot and seam welding of steel, and the ELMET range of alloys is provided for this purpose in the form of rod, bar or discs, or as finished spot welding electrodes or seam welding wheels.

With the increasing use of automatic or semi-automatic processes, long trouble-free runs become of greater and greater importance and the use of COPELMET facings on electrodes, dies and jigs can be a dominant factor in reducing downtime and maintenance and bringing about the maximum uninterrupted running of machines and equipment, and in addition improved and consistent quality.

Full information on all aspects of resistance welding with ELMET materials is available on request.

We acknowledge with thanks the kind co-operation of VAUXHALL MOTORS LIMITED *in providing the examples of electrodes illustrated and described above.*

COPELMET 'PW' FOR RESISTANCE WELDING DIES

METRO-CUTANIT

METRO-CUTANIT LIMITED
Associated with Metropolitan-Vickers Electrical Co. Ltd.
GRAPPENHALL WARRINGTON LANCASHIRE

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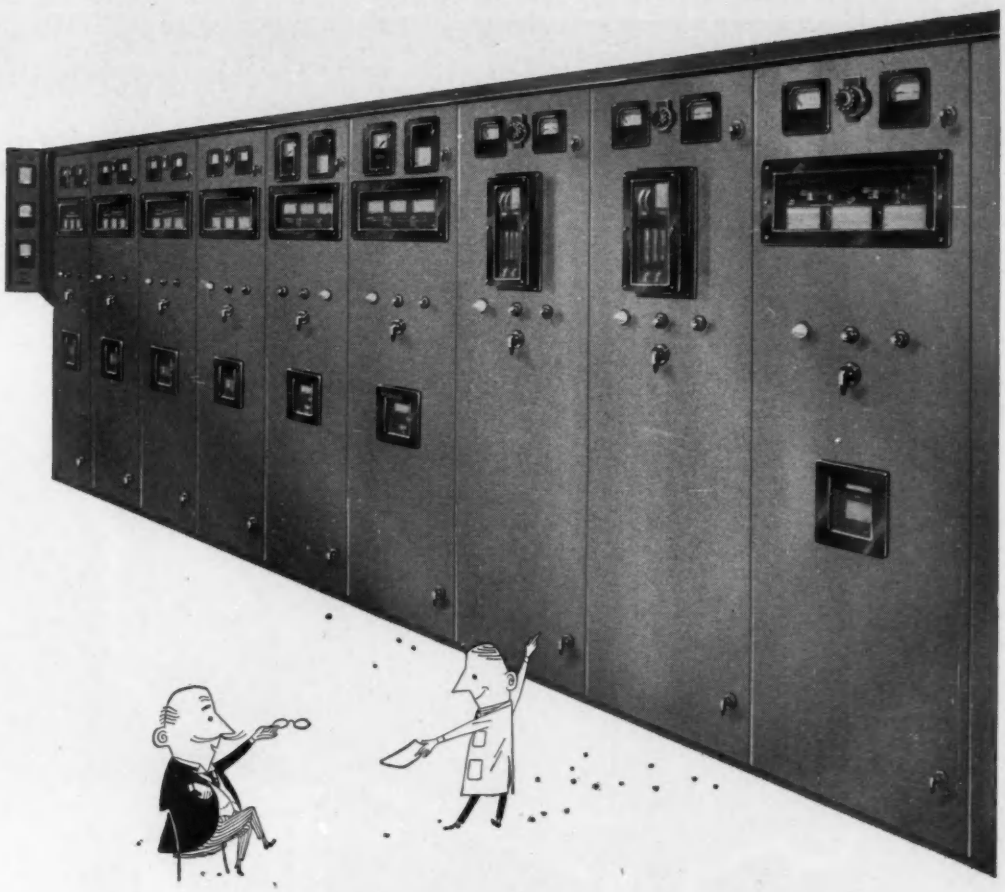

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Well sir, by ordering standardized switchgear from Brush you get better delivery. You get uniform, clean appearance, too. And you get a better price.

You mean it's cheaper to install this standard stuff?

Exactly. No drawing-office time to pay for. And you get the benefit of large-scale production.

Ah. That's all very well. But the important thing is: how well is the equipment going to do the job? Surely, switchgear built to the specification of our own people is likely to be better suited to our needs?

Well, no. That doesn't follow. The thing to remember is that Brush have been in this game a long time. And from their tremendous experience and research they have learnt that most requirements can be met by a few basic designs, with optional additions to meet customers' special needs. And you can take it from me – no finer electrical switchgear comes out of any factory, anywhere.

Mm. What about maintenance?

No problem at all with Brush equipment. It's all so well designed, so beautifully built, so painstakingly tested, that failures are practically eliminated and maintenance is as easy as . . .

You've made your point. We'll order standardized switchgear from Brush.

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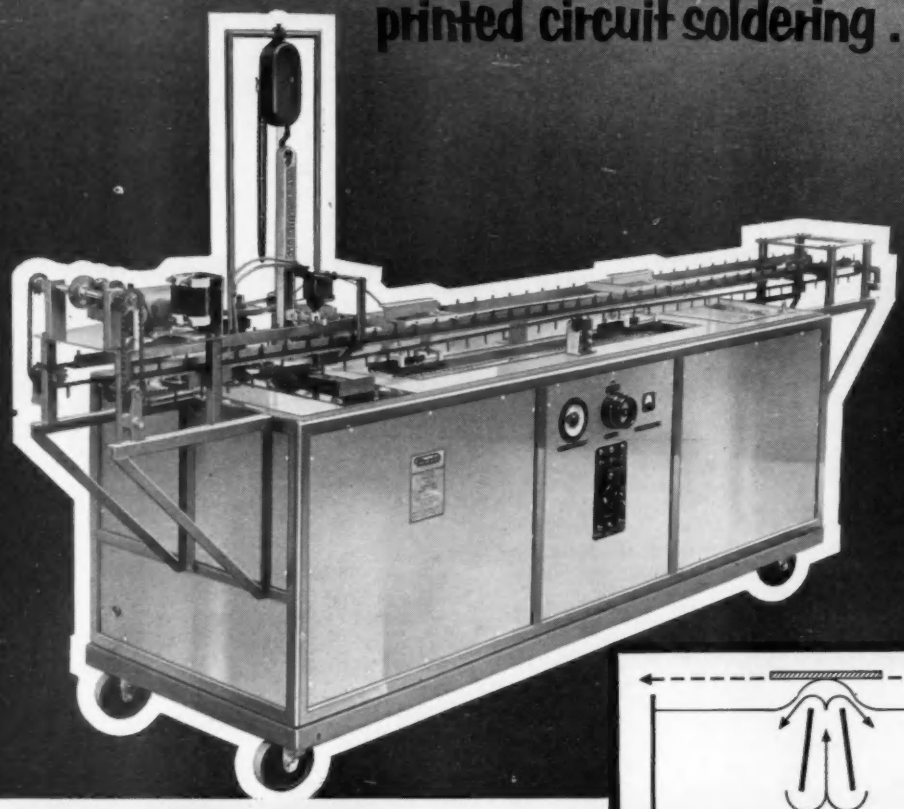

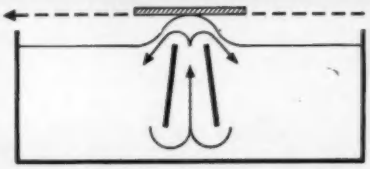

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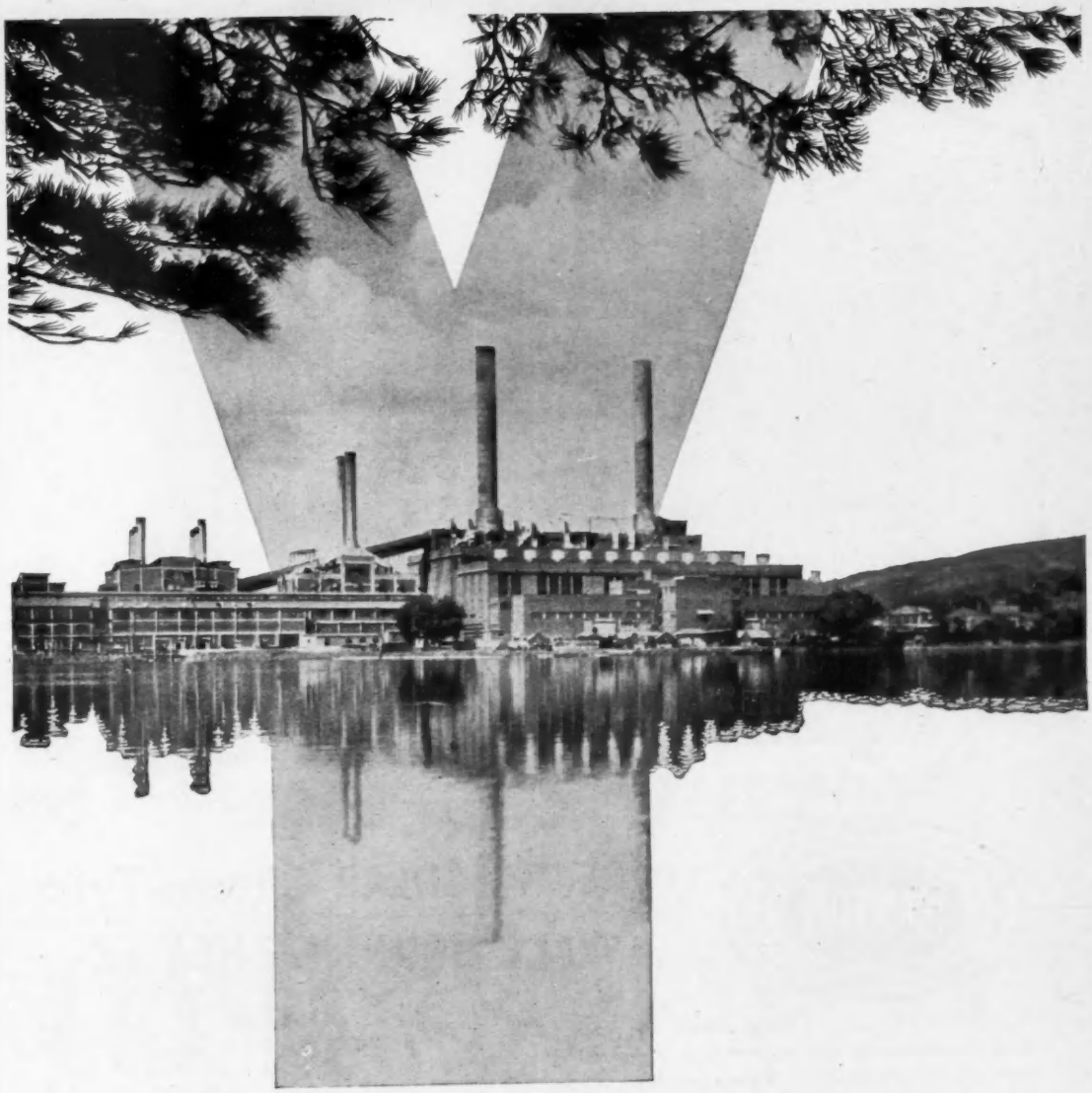

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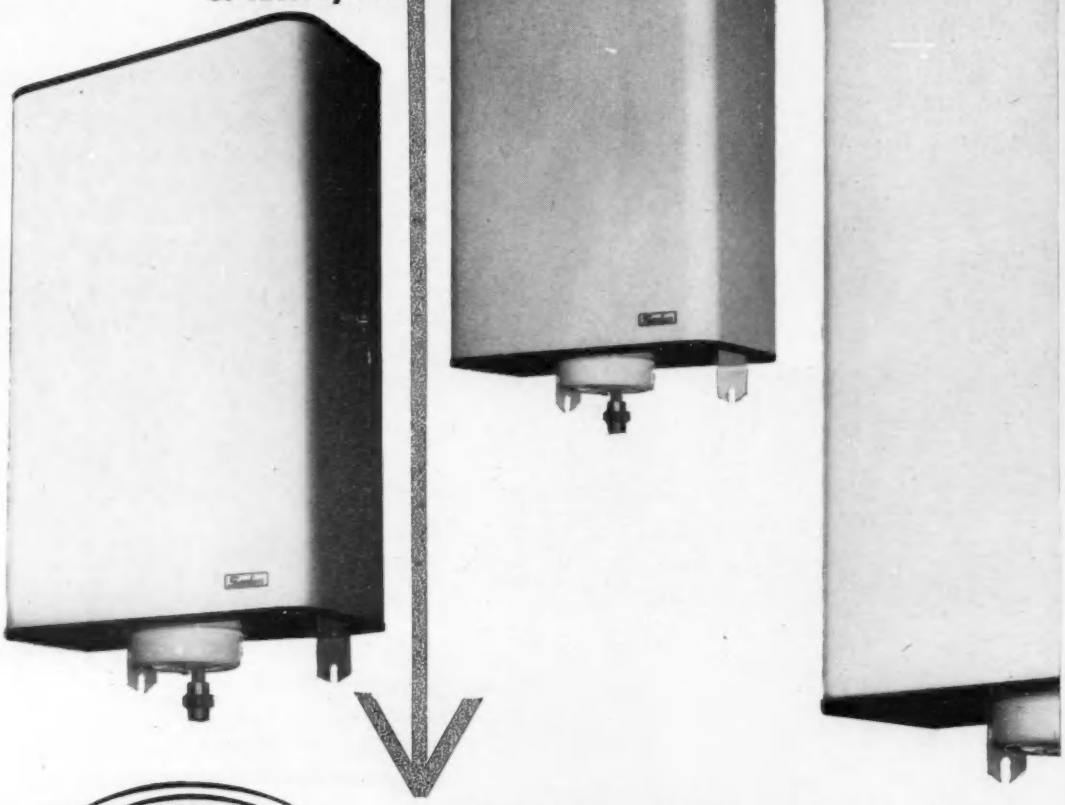

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A completely new design, this thermal storage water heater incorporates the most modern manufacturing techniques and a contemporary shape and finish which will fit into any decorative scheme.

The heater is, of course, completely automatic.

The units incorporate their own ball valve tank and are suitable for connection direct to Town's Water Mains and for supplying water to two or more points.

FINISHED IN white baked-on enamel with black top and base.

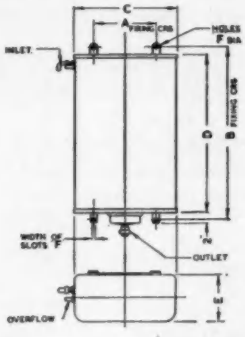
VOLTAGE RANGES. 200/220 volts. 230/250 volts.

CAPACITIES		5	7½	12	15	20 gall.
STANDARD LOADINGS	210 V	920 W	920 W	1530 W	1530 W	1530 W
	240 V	1200 W	1200 W	2000 W	2000 W	2000 W

WALL MOUNTING RECTANGULAR D.F.

CAPACITY	A	B	C	D	E	F
5 Gall.	12½"	33⅜"	19¼"	30¼"	9"	½"
7½ Gall.	14"	34⅜"	21¼"	31¼"	10"	½"
12 Gall.	16"	37⅜"	23¼"	34¼"	11⅜"	⅝"
15 Gall.	16"	37⅜"	25½"	35½"	14½"	⅝"
20 Gall.	20"	37⅜"	28½"	35¼"	15⅝"	⅝"

INLET ¾" B.S.P.T. OUTLET ¾" B.S.P.T.



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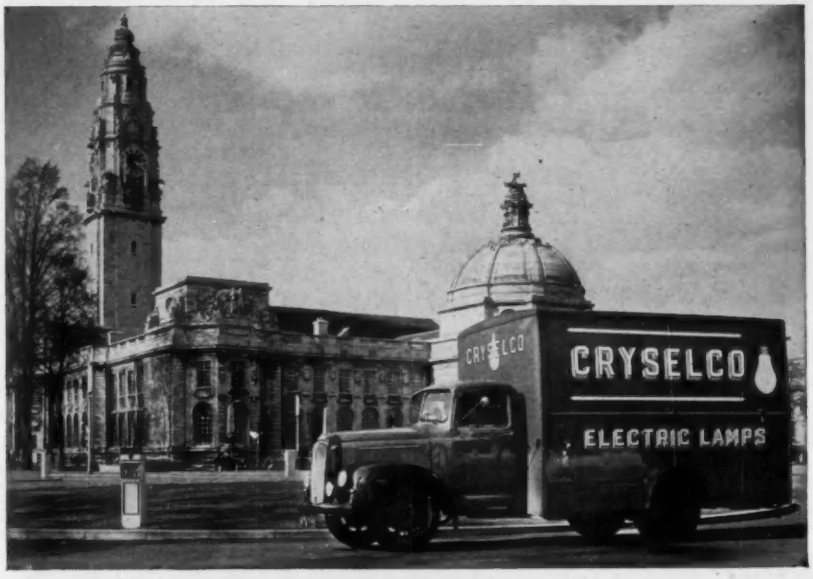

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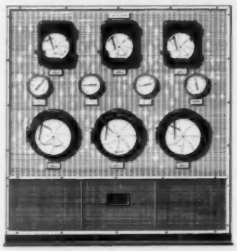

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The finest raw materials.

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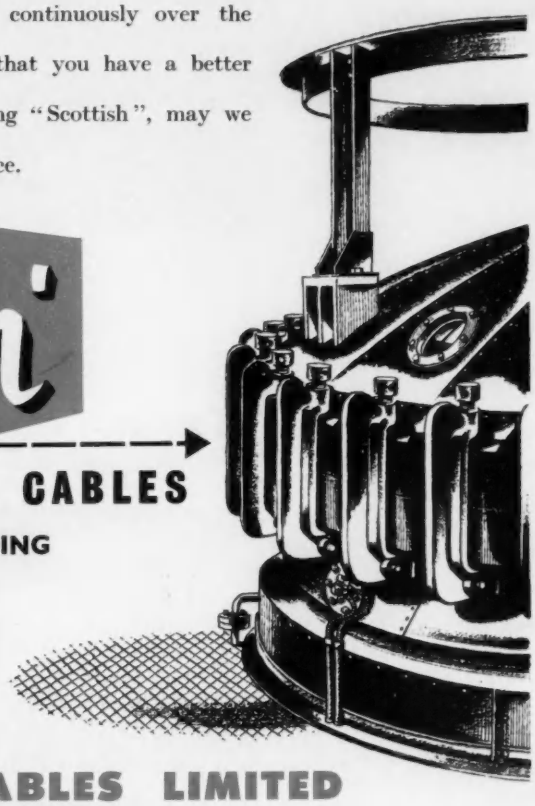

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Switchboard with 800A and 1600A air circuit breakers in double tier formation

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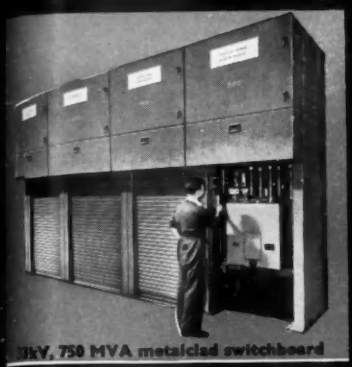
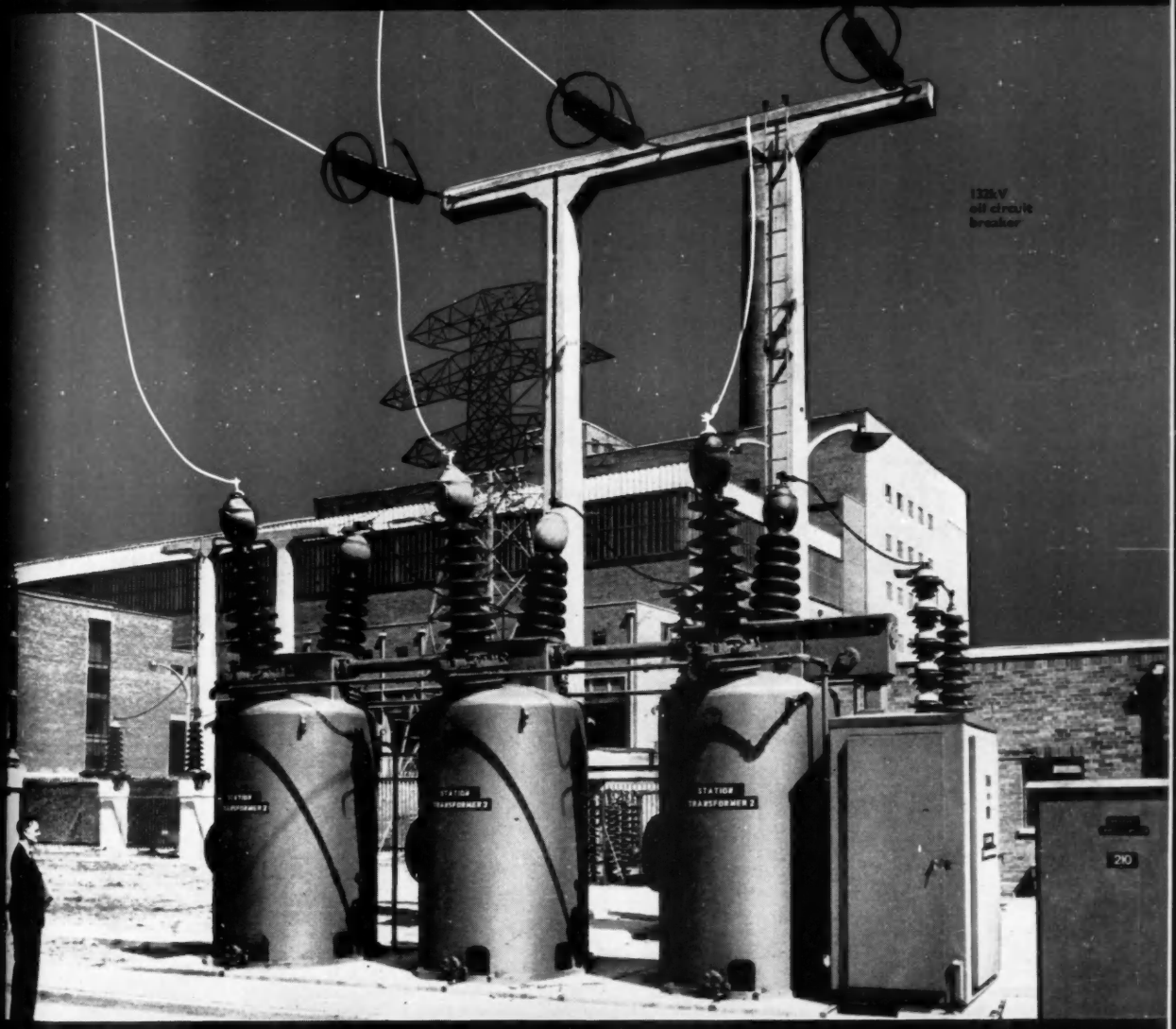
You are invited to ask for the Technical Descriptions of the above switchgear



kV, 750 MVA metalclad switchboard

66kV oil circuit breaker with pneumatic operating gear



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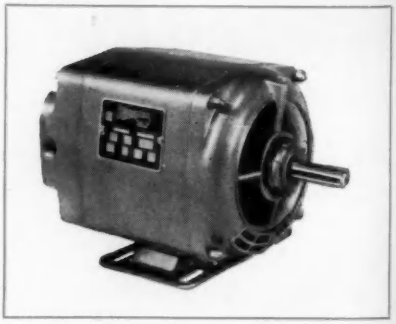

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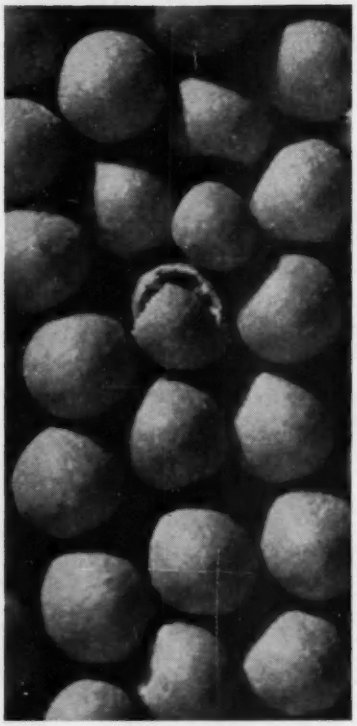

that this picture shows a clutch of turtles' eggs? Maybe you're not too sure.*

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**(*The "eggs" are really the heads of matches.*)*

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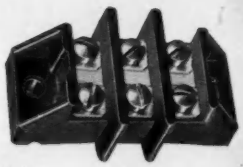

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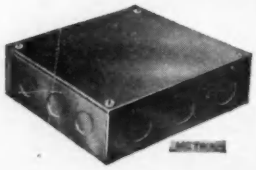

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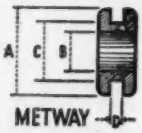

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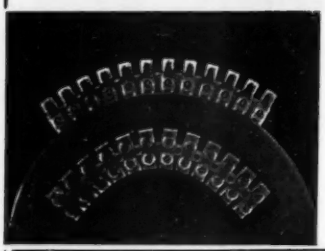

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FP.67

UNIT AND CUBICLE CONSTRUCTION
SWITCHBOARDS

Illustration on right shows an indoor totally enclosed unit construction type "Y" switchboard with incoming duplicate busbars feeding common outgoing circuits by means of interlocked fused switches of both 300 amp and 500 amp capacity.

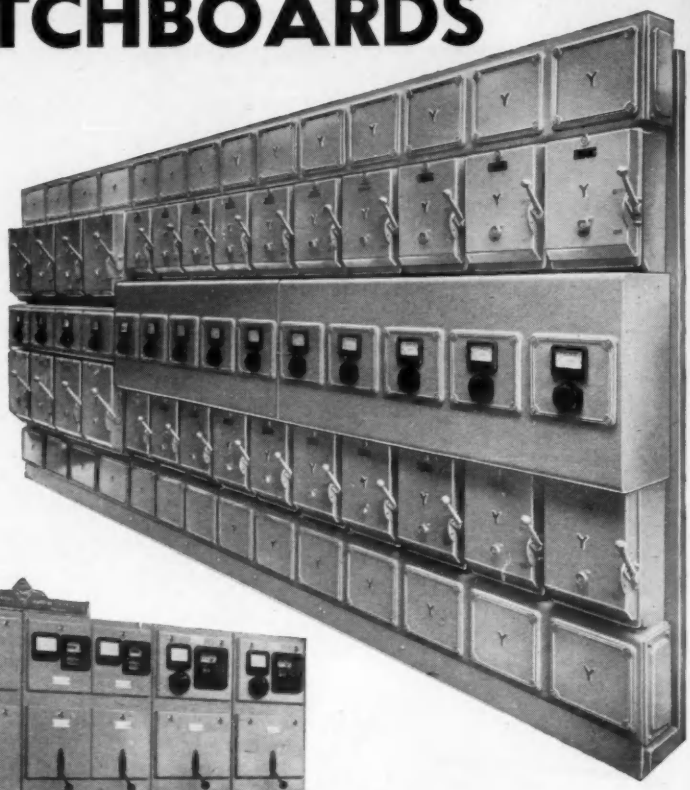

Illustration below shows an indoor all-isolating cubicle construction switchboard having individual metering on the outgoing fused switches of 60 amp, 160 amp and 300 amp capacity.

Patent No. 783957

We specialise in building switchboards to your exact requirements with facilities for extension. Designed to give unfailing service under the most onerous climatic conditions whether installed indoors or out of doors.

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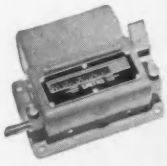
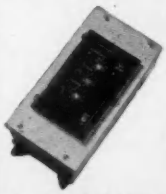


Predetermined Counters for counting predetermined quantities.



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AUTOMATIC STARTERS
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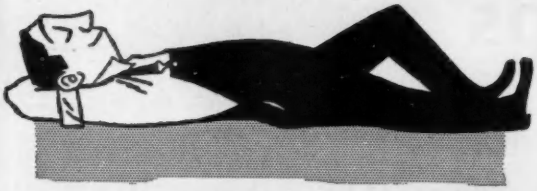

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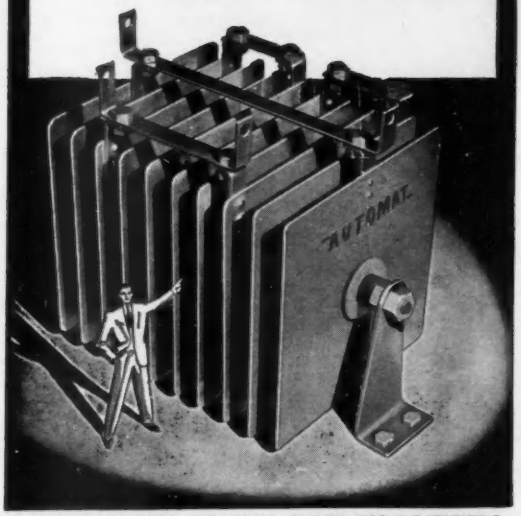

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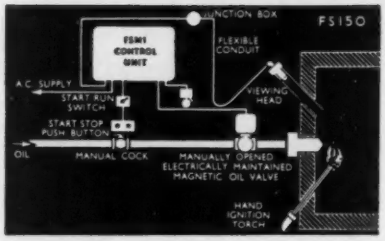

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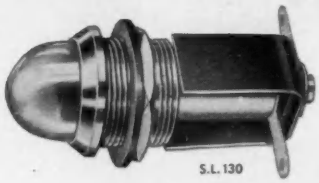
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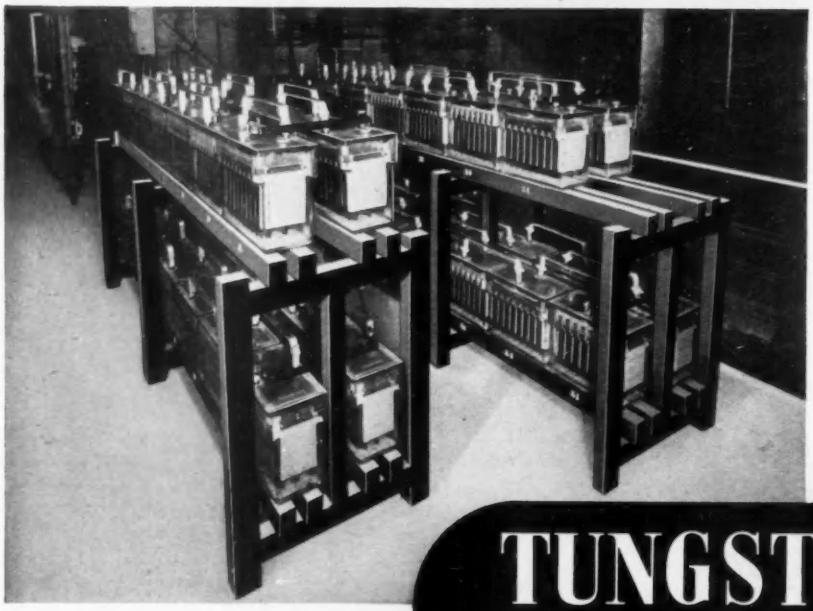

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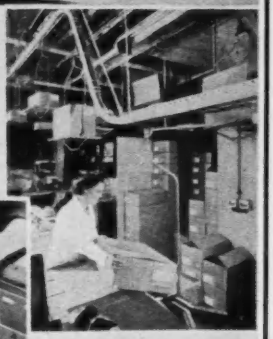
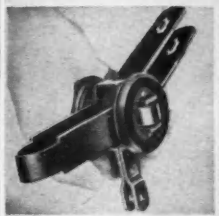


Down to bench level then up and away. The P.C.P. working at Smith's Motor Accessories Limited.



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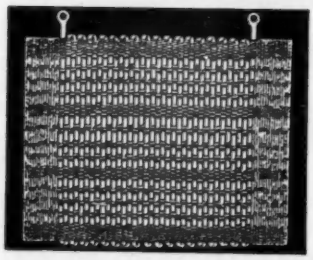

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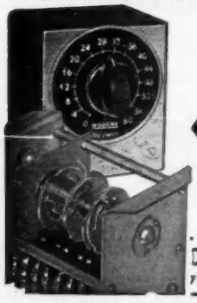

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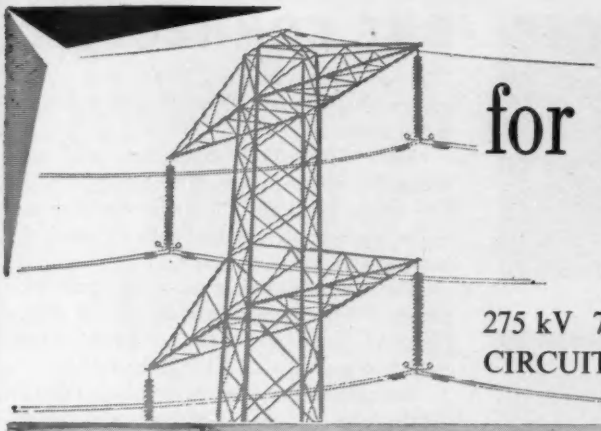
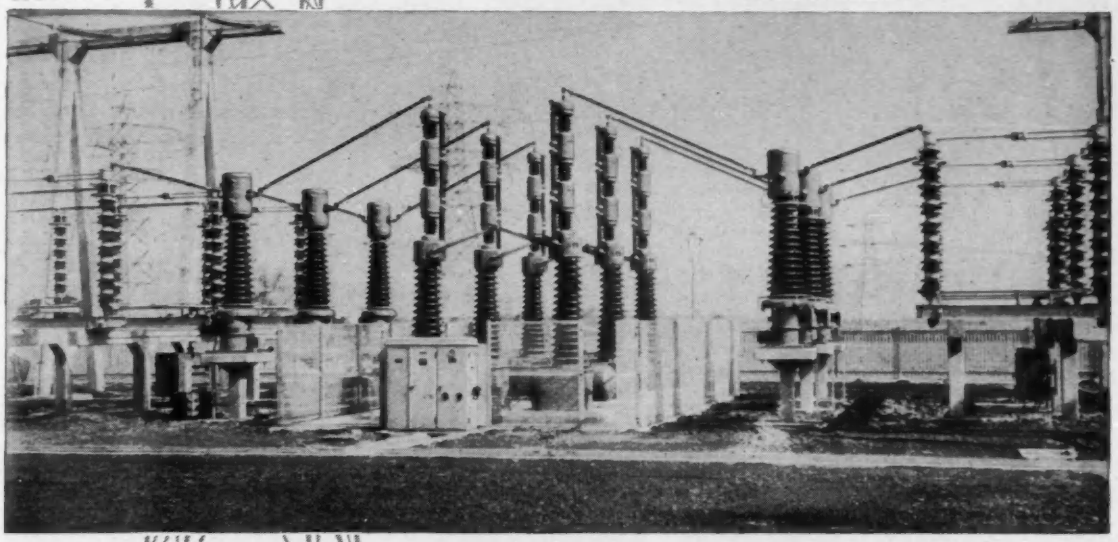
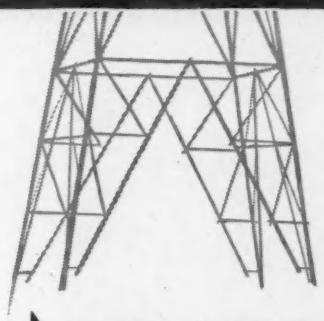


for Britain's Super Grid

275 kV 7500 MVA AIR-BLAST CIRCUIT-BREAKERS





Part of a 9-circuit 275 kV Super-Grid Switching Station at Harker in the North West, Merseyside and North Wales Region of the Central Electricity Generating Board, incorporating 'ENGLISH ELECTRIC' 7500 MVA air-blast circuit-breakers. Similar equipment has been supplied or is on order for Rochdale, Connah's Quay, Sundon, Canterbury, Northfleet West and Hinkley Point.

'ENGLISH ELECTRIC'

switchgear

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

Switchgear Department, Stafford

WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

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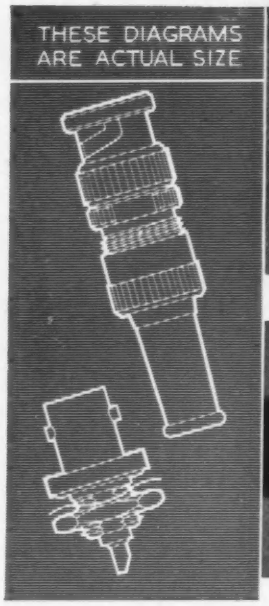
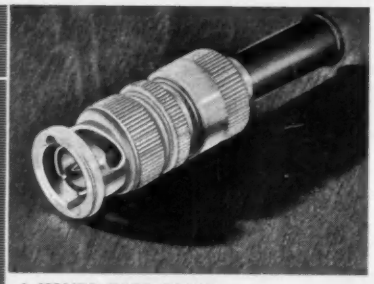
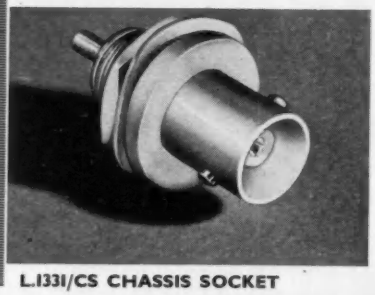




L.1331/FP FREE PLUG



L.1331/CS CHASSIS SOCKET

BNC CONNECTORS

This new range is designed for electronic V.H.F. applications, such as N.A.T.O. and Service equipment, laboratory use, etc.

The "Belling-Lee" connectors are interchangeable with their American counterparts, and have certain advantages. The improved cable grip action has been designed to hold the connector firmly on the end of the cable.

The five connectors at present in production consist of a free plug, a right-angled free plug, a free socket, a fixed socket, and a bulkhead adaptor (socket to socket) with P.T.F.E. insulation.

The nominal characteristic impedance throughout the range is 51 ohms, and these connectors can be used up to frequencies of at least 3,000 Mc/s. They are designed for use with "Uniradio" 43 cable and the standing wave radio introduced by the connector when it is used with this cable is less than the tolerance of the characteristic impedance of the cable itself.

Comet 4 carries 736 "Belling-Lee" components, comprising various types of fuses and fuse-holders

Voltage standing wave ratio: Measured up to 900 mc/s FP and FS less than 1.08 to 1, other types less than 1.2 to 1.

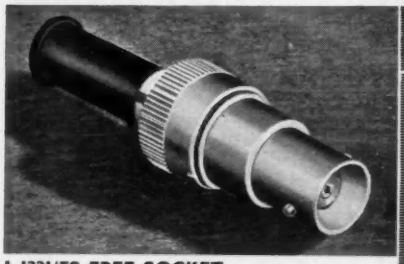
Min. and max. panel thickness: L.1352/BS (bulkhead adaptor not illustrated) min. $\frac{1}{16}$ in., max. $\frac{1}{8}$ in. L.1331/CS min. $\frac{1}{16}$ in., max. $\frac{3}{16}$ in.

Finish: Silver-plated.

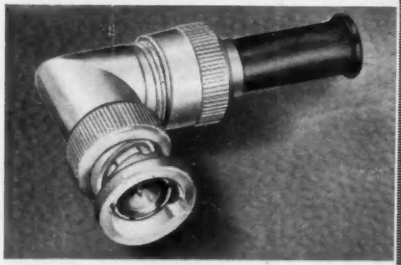
Weight:

BS	CS	FS	FP	RFP	
27	10·5	15	22	26	grams
·95	·37	·52	·77	·92	oz.

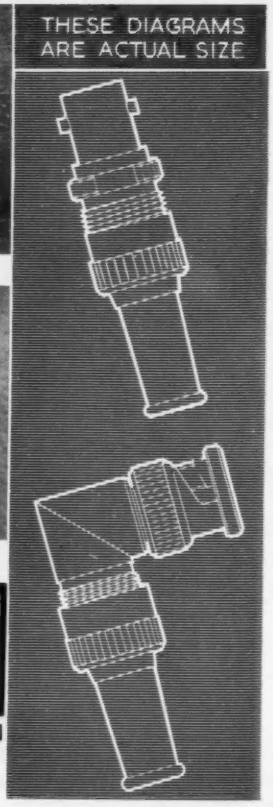
Most "Belling-Lee" products are covered by patents or registered designs, or applications therefor.



L.1331/FS FREE SOCKET



L.1331/RFP RIGHT-ANGLE FREE PLUG



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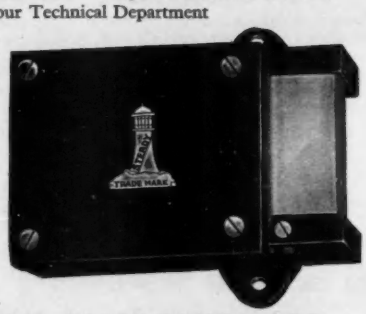

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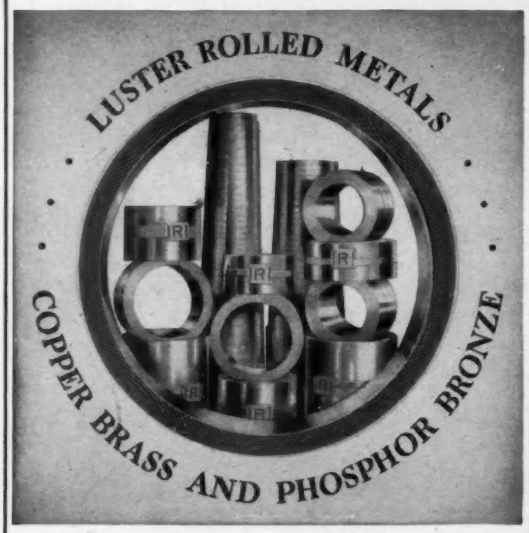
LONDON, W.1 Telephone : MUSeum 4414, 4415 and 6388



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SPARKLETS
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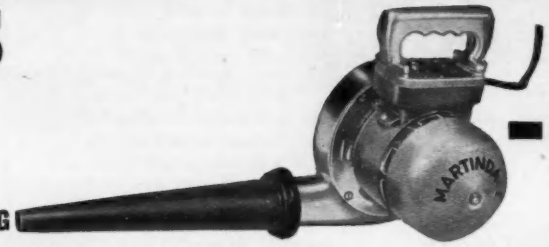
SPARKLETS LIMITED · WIRE BRAIDING DIVISION · TOTTENHAM N17

The NEW MARTINDALE Portable BLOWERS

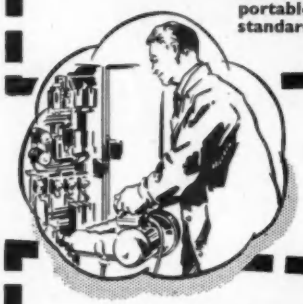


POWERFUL BLOWING

The powerful Martindale Blowers direct a stream of dust-removing air into every inaccessible crevice of electrical and other machinery, thus removing a common cause of short circuits and motor failures.

EFFICIENT SUCTION

All of the five blowers are instantly converted into portable industrial suction cleaners by the use of standard attachments at little cost.

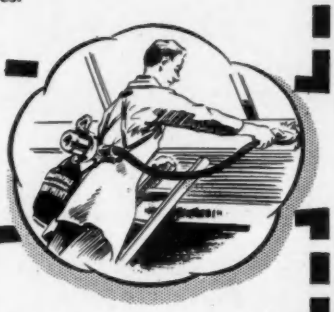


HOT AIR DRYING

An independent Heater is available for attachment to the Blowers, which produces hot air for the quick drying of coils, transformers and for many other purposes.

THE "PORT-A-VAC" (regd.)

The "Port-A-Vac" (regd.) light-weight harness permits the Martindale Blower to be used as a powerful vacuum cleaner carried in comfort upon the operator's back leaving him free to climb ladders, etc., to clean out-of-reach parts of the factory.



"MARTINET" WET-DRY SUCTION PICK UP

With this amazing equipment any Martindale Blower is converted into a suction cleaner which picks up both *liquids* and *solids*, the liquids and dirt being deposited into the special tank and only the airborne dust into the filter bag.

For full details of Specifications of Martindale Maintenance Equipment write to:—

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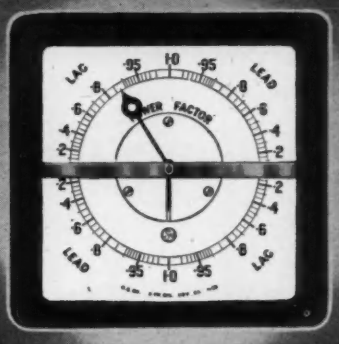

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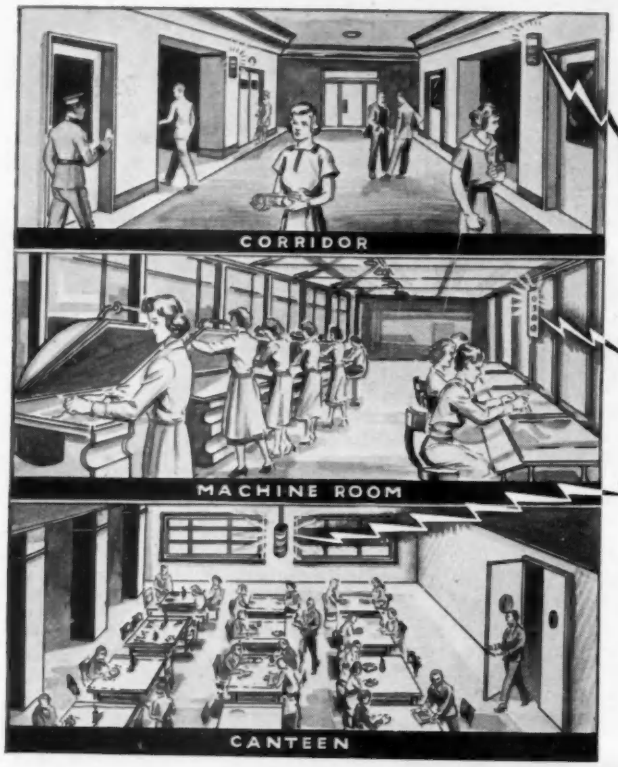

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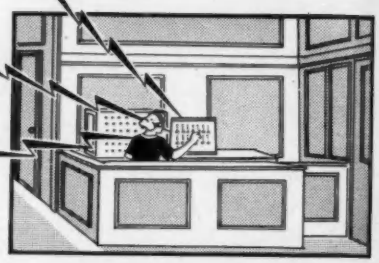

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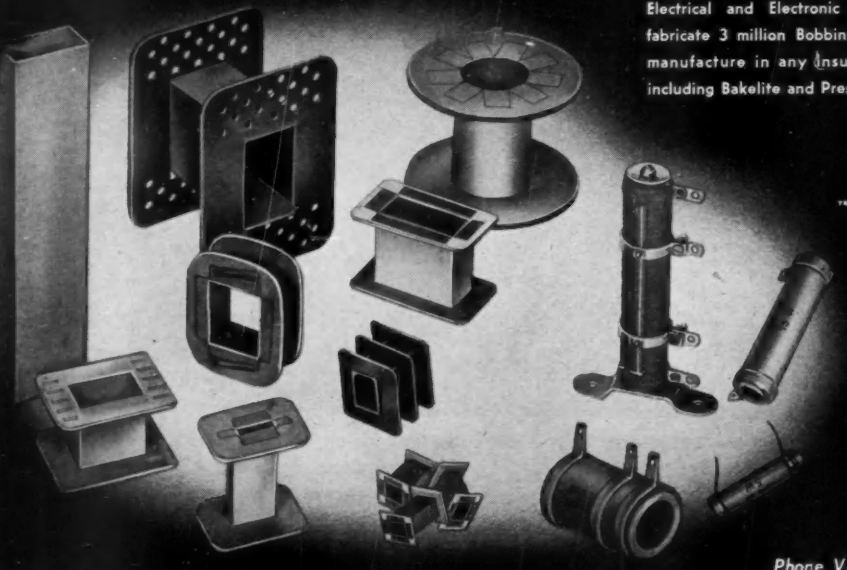

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Araldite epoxy resins provide the answer to many problems encountered in the manufacture of electrical equipment. Bushings are a good example. Made with Araldite, they exploit the outstanding properties of the epoxies—remarkable void-free adhesion to metal, outstanding anti-tracking qualities, high mechanical strength, low shrinkage, stability, resistance to climatic conditions and chemicals and excellent dielectric properties. The components shown are cast bushings for use in air, oil or compound on potentials up to 11,000 V, and are manufactured by J. R. Ferguson (Electrical Engineers) Limited, Dukinfield, Cheshire.

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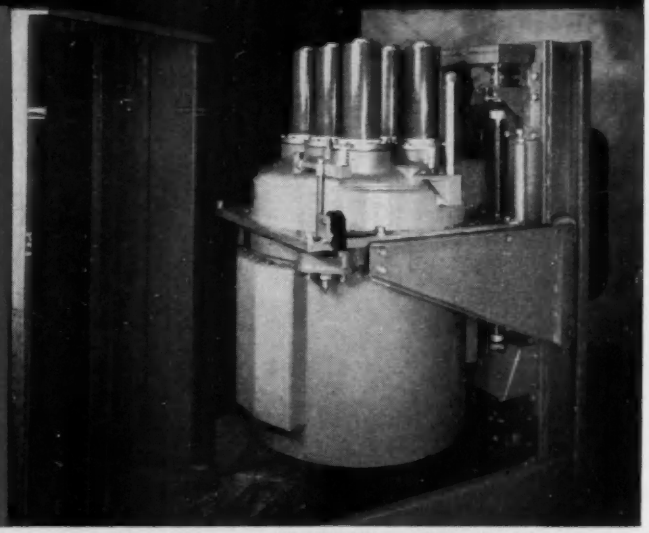

Photograph by courtesy of The British Thomson-Houston Co., Ltd.

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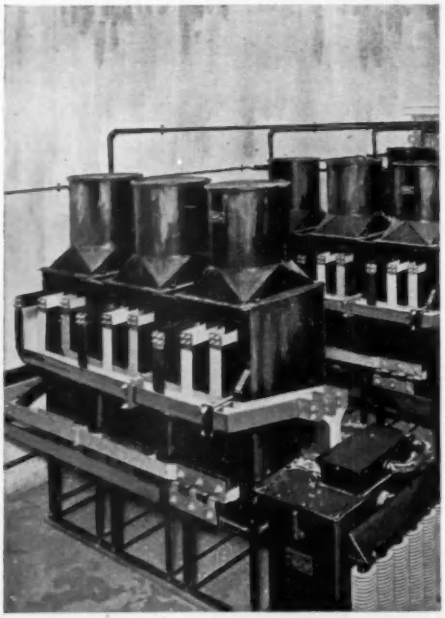
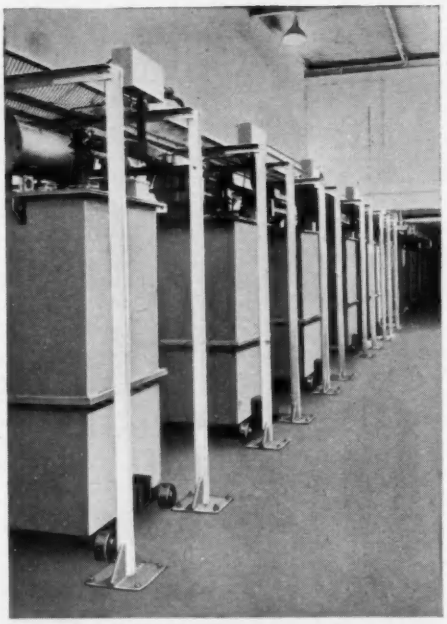


1935 *Two sets totalling 3 000 amperes, part of a copper-oxide rectifier installation at Fescol Ltd.*



1957 *Westalite forced-oil water-cooled rectifiers totalling 35 000 amperes for a Canning's zinc plating process at Margam Electro Finishes Ltd.*

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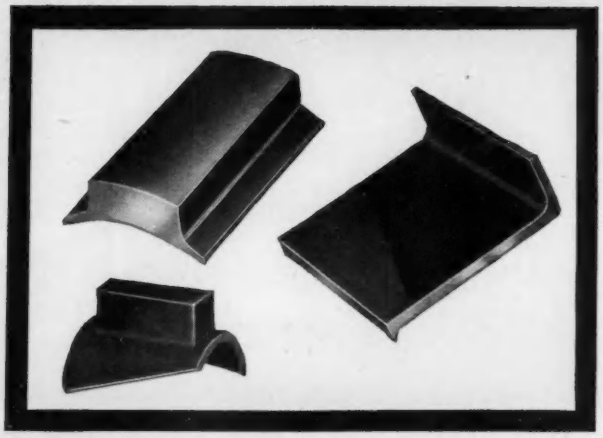

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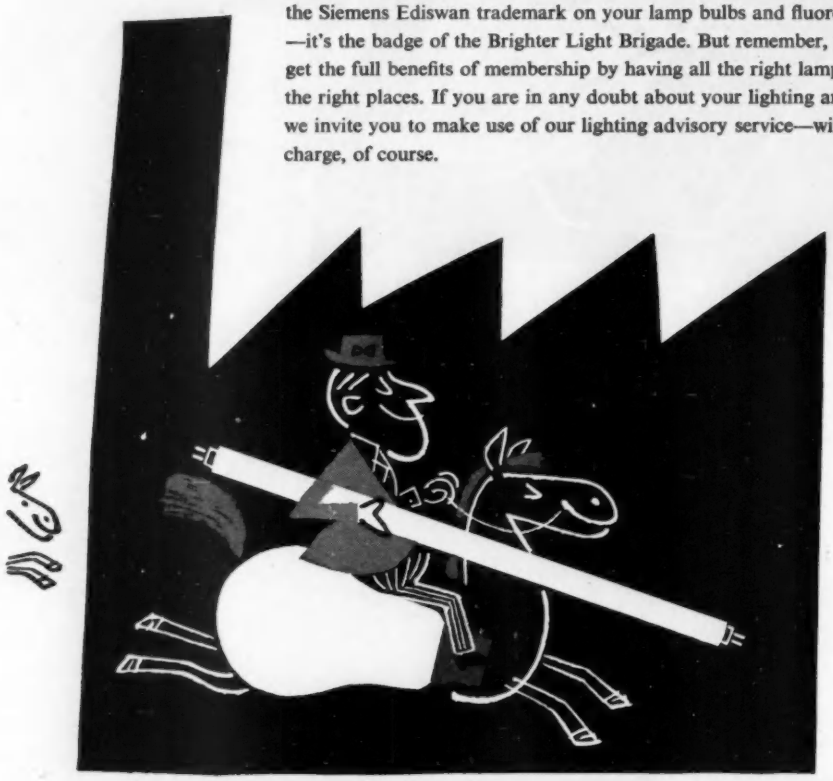

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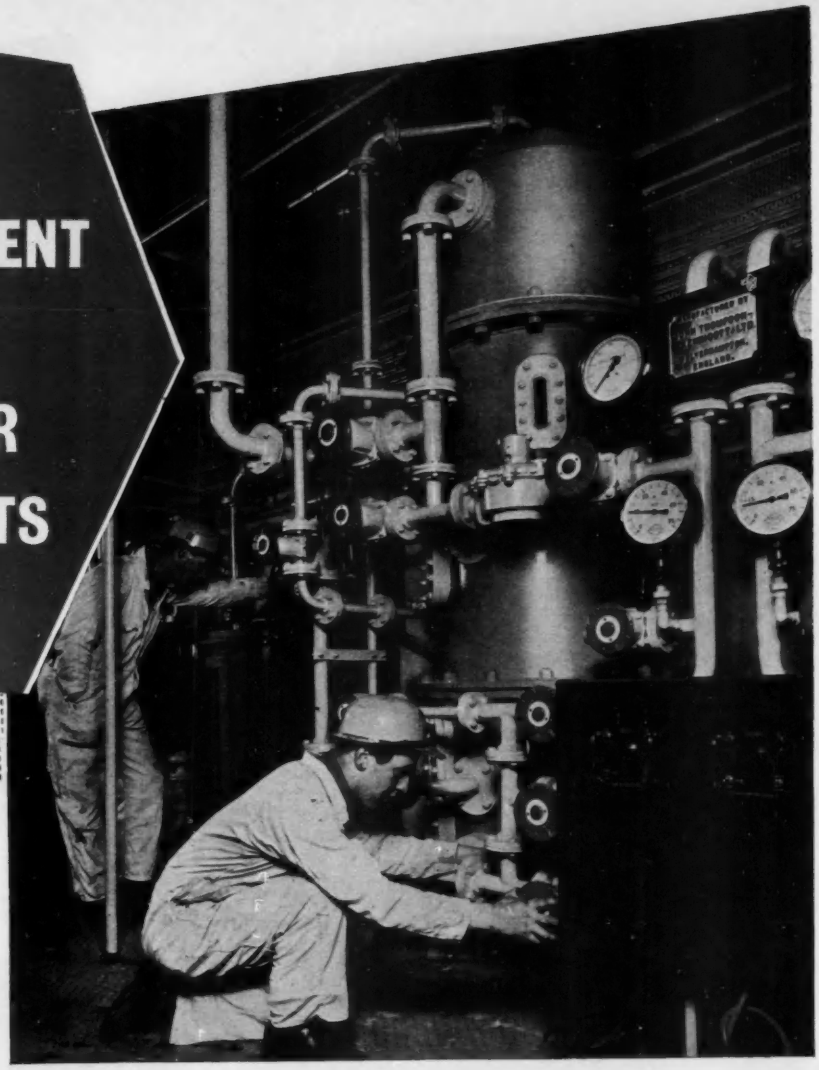
WATER TREATMENT FOR NUCLEAR PROJECTS



Steam-raising requirements in nuclear projects, as in industry and thermal power generation, demand feed-waters of correct quality for the particular application. The John Thompson-Kennicott mixed-bed de-ionisation units seen here are installed to treat the boiler feed water for the U.K. Atomic Energy Authority's fast reactor at Dounreay.

The Company undertakes investigation and production of suitable plant for de-ionisation, precipitation, filtration and other means of water treatment. It has substantial research facilities and is carrying out continual investigation into the use of industrial resins and the treatment of radio-active effluents.

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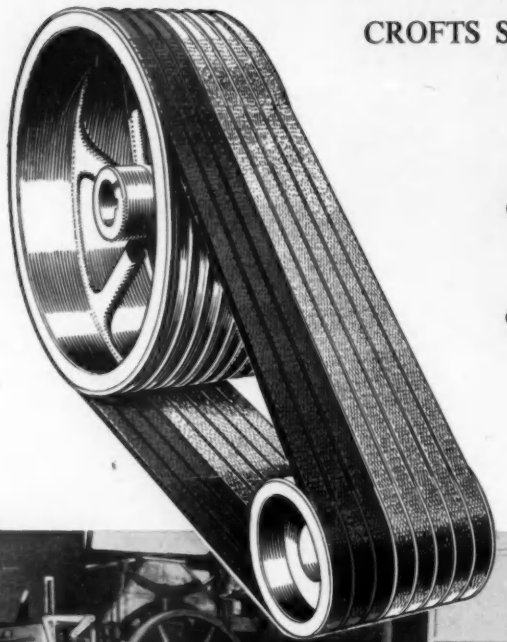
V-dri

CROFTS MAKE



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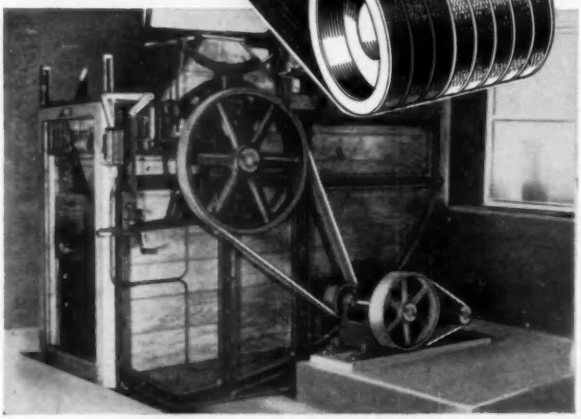
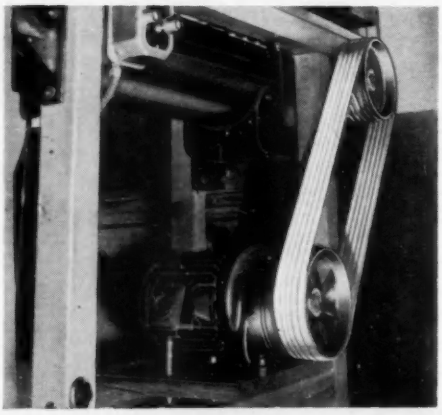
- pulleys supplied with either parallel-bored and keywayed or fitted with quick-change Crofts Patent Taper-Flushbush

drives up to 130 hp from stock





These applications are typical examples of the adaptability of Taper-Flushbush V-rope Pulley drives

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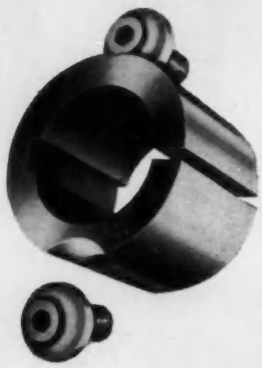

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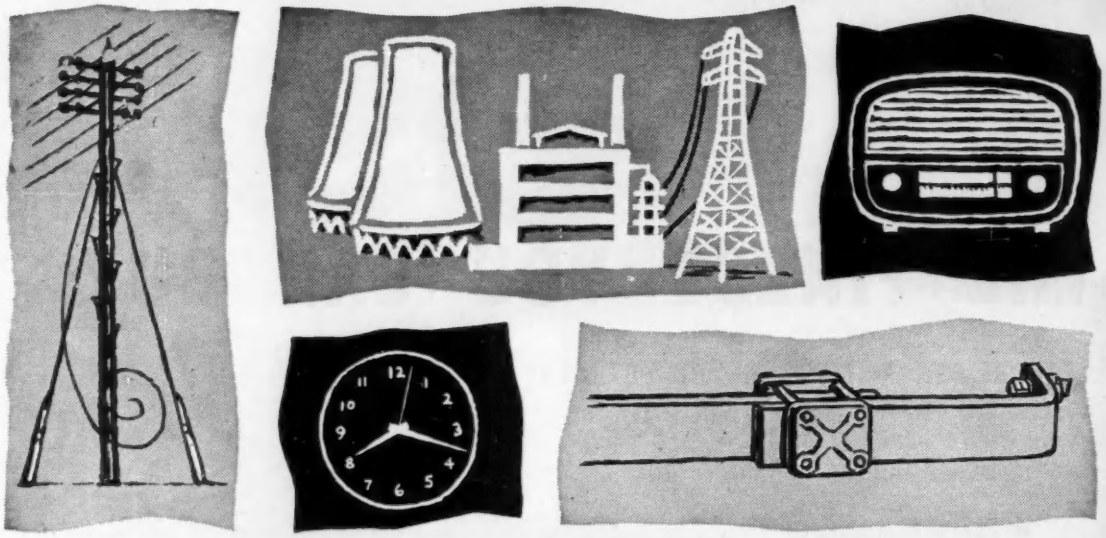

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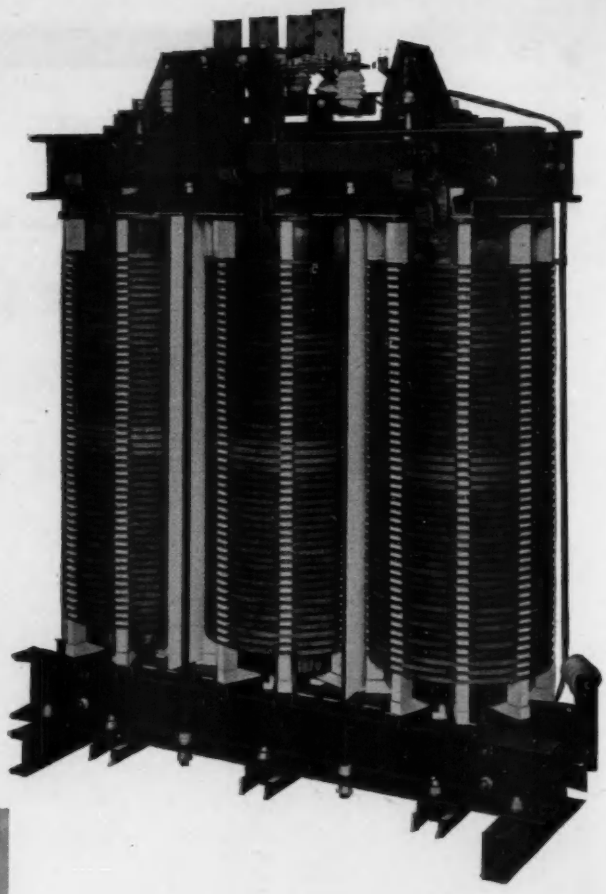
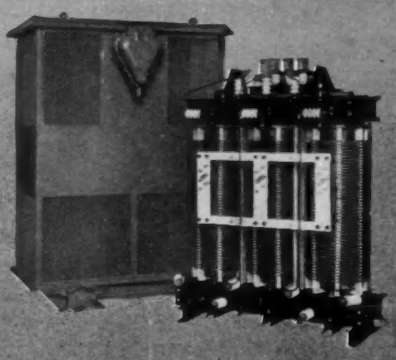
BRYCE

DRY TYPE
AIR COOLED
CLASS-C
TRANSFORMERS

SILICONE INSULATION SILICONE INSULATION SILICONE INSULATION





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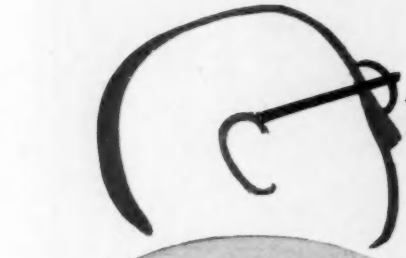

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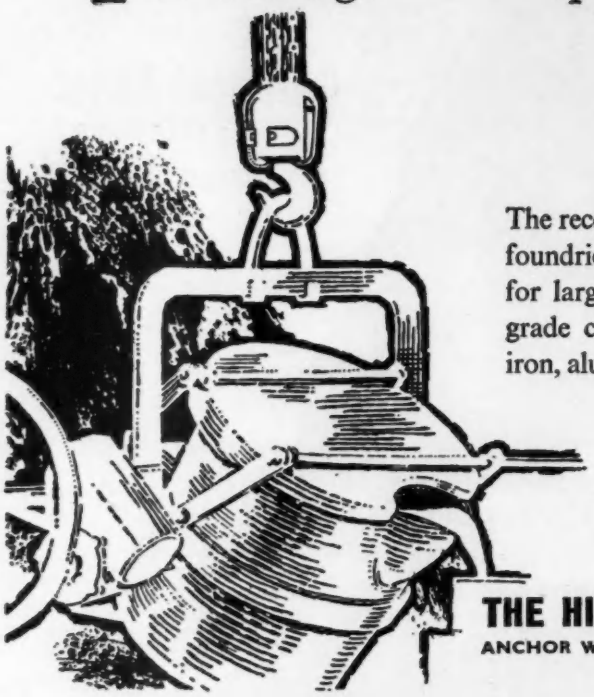

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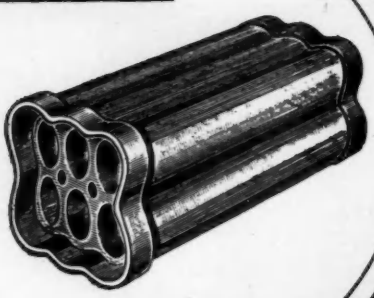

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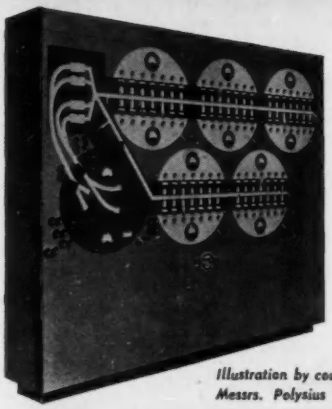

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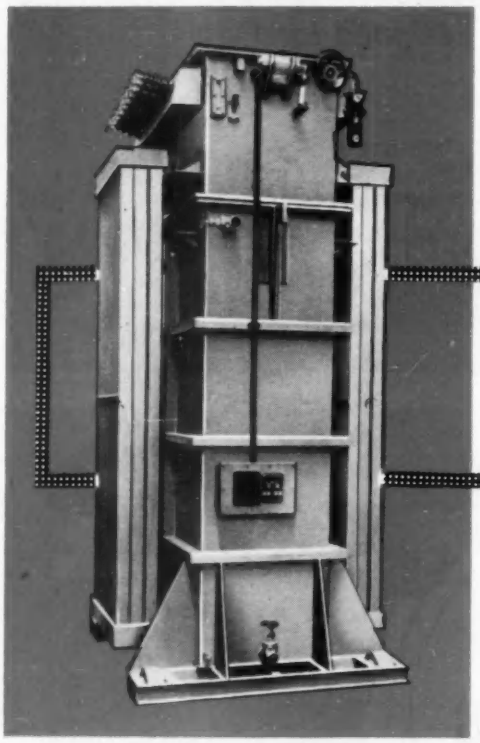

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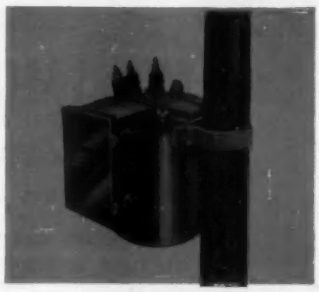

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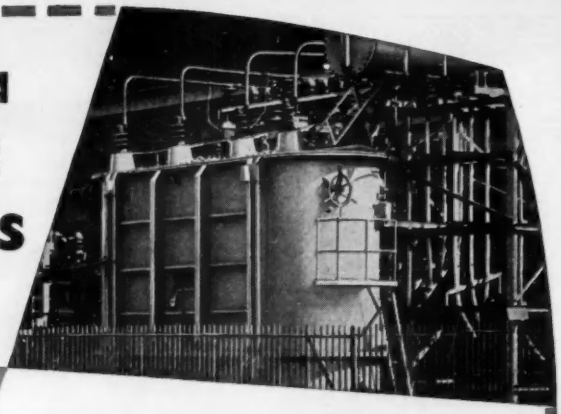

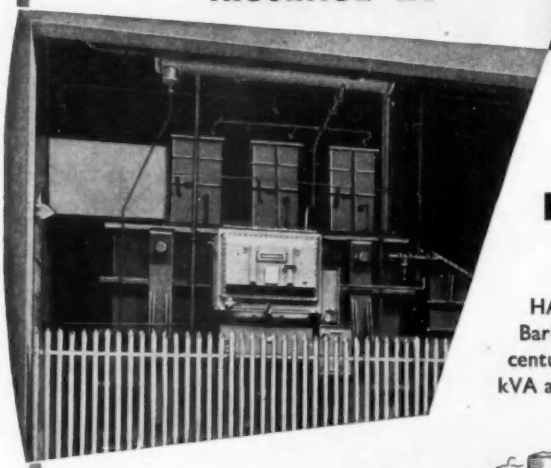

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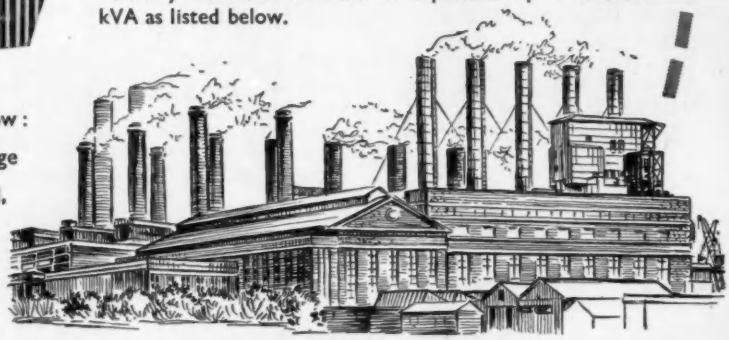
LONDON

HACKBRIDGE TRANSFORMERS have been installed at Barking Power Station over a period of a quarter of a century and include units in capacities up to 93,750 kVA as listed below.

The installations illustrated show: above, one of the four Hackbridge 93,750 kVA transformers, and, below, one of the three 88,750 kVA Units at Barking Power Station, London.



Four 93,750 kVA	Two 12,500 kVA	Four 600 kVA
Three 50,000 kVA	Two 10,000 kVA	Four 900 kVA
Three 88,750 kVA	Five 7,500 kVA	Four 250 kVA
Four 30,000 kVA	Four 4,500 kVA	Four 150 kVA

Also other miscellaneous units totalling 4,000 kVA

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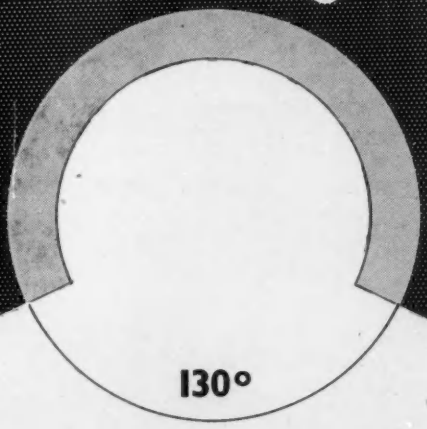

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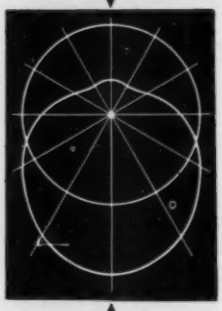

Light distribution comparison diagram

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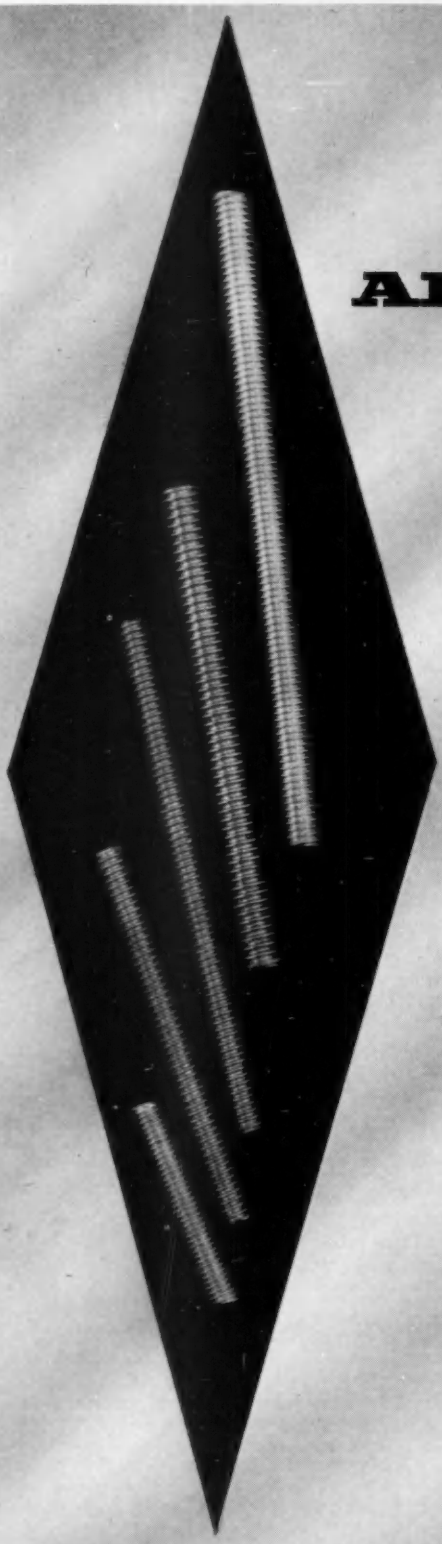

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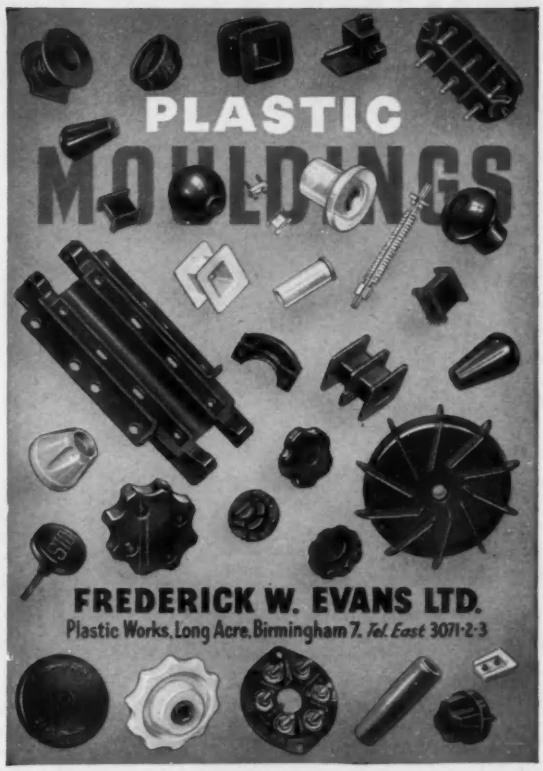

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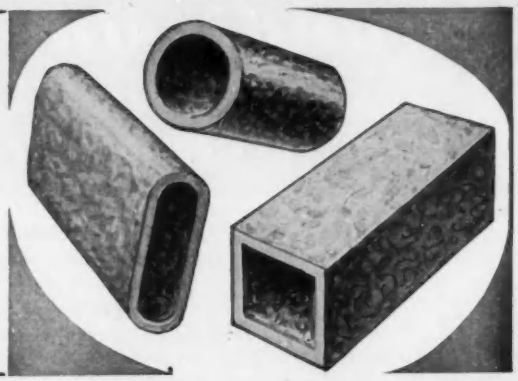

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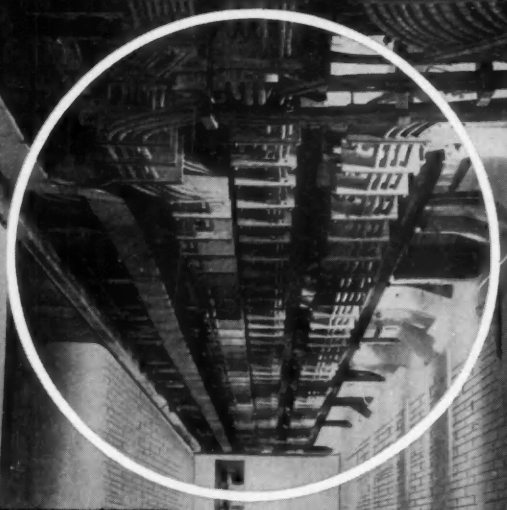

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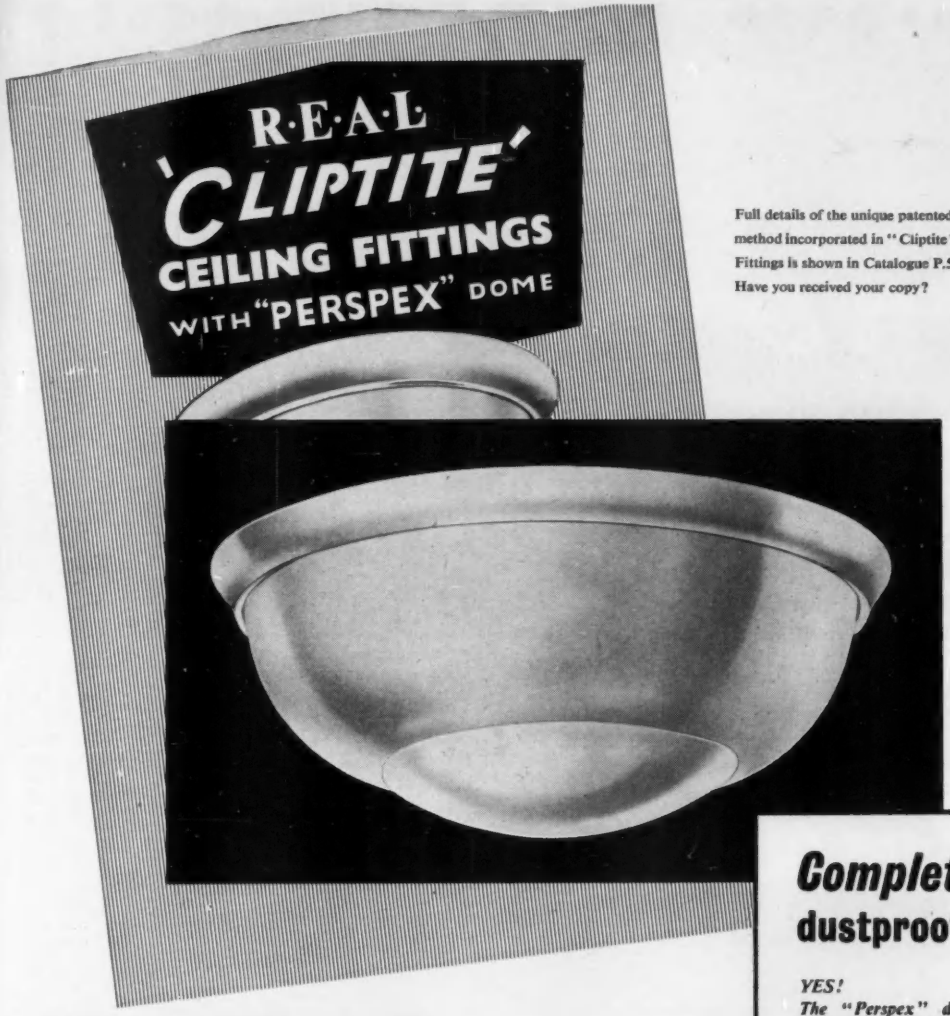

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Fitted or removed in literally a second, the dome is securely sealed in position by stainless steel bayonet catch fitments. Double springing obviates any trace of backlash.

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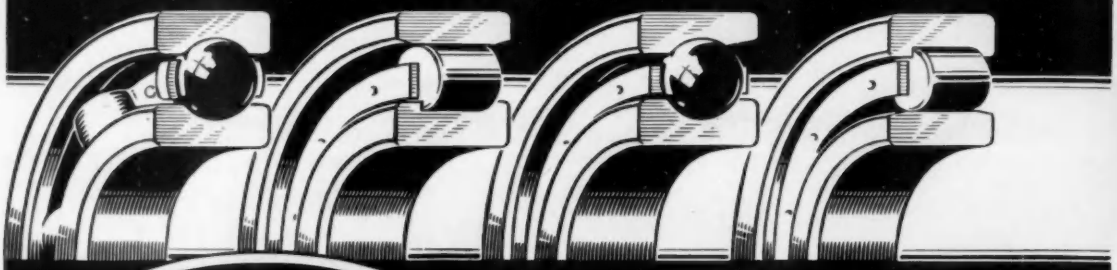

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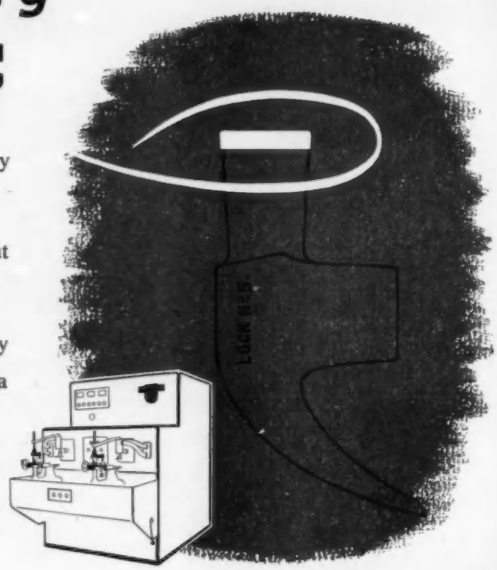

15kW output installation used for hardening and tempering hammer heads. Photo by courtesy of Lock Tools Ltd. Oldbury

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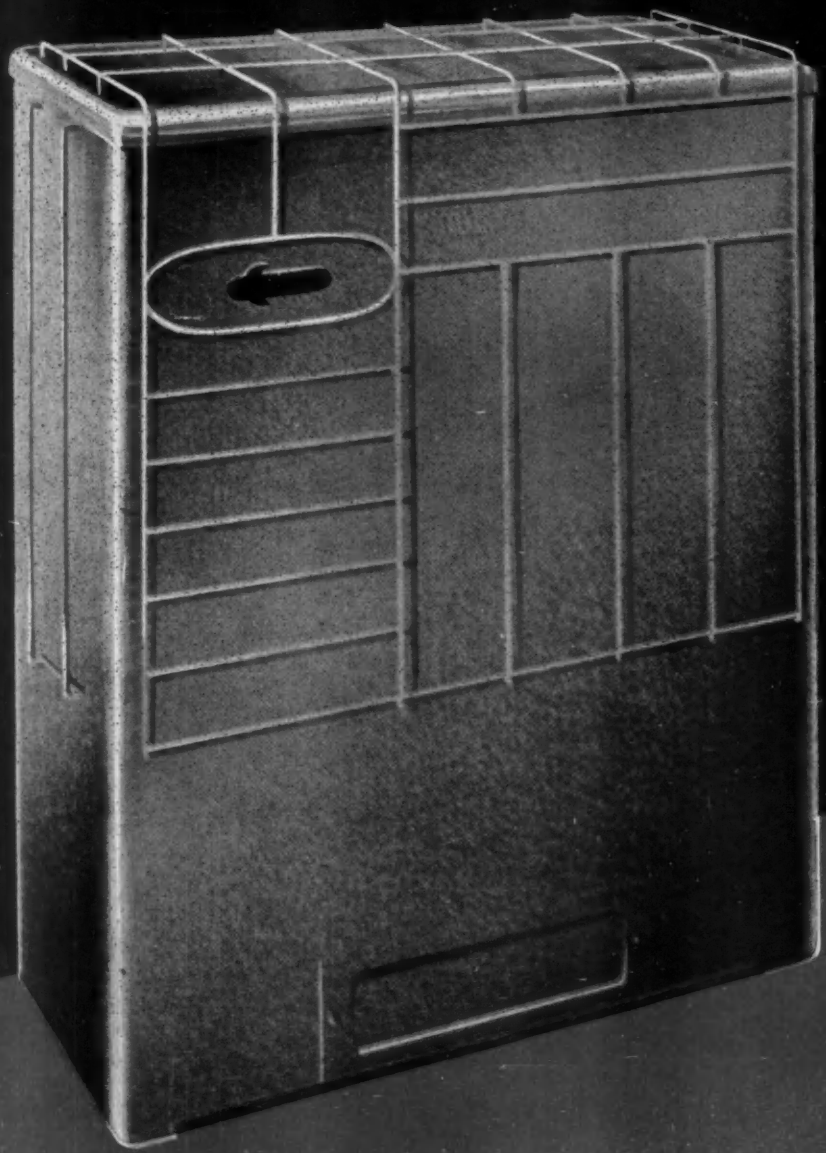

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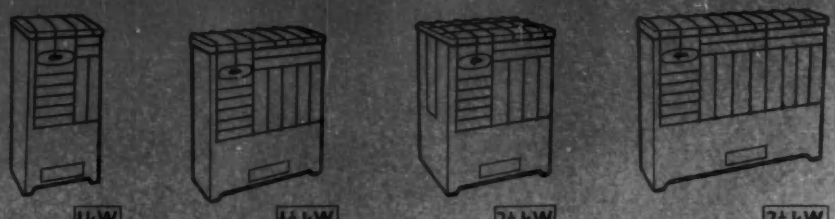

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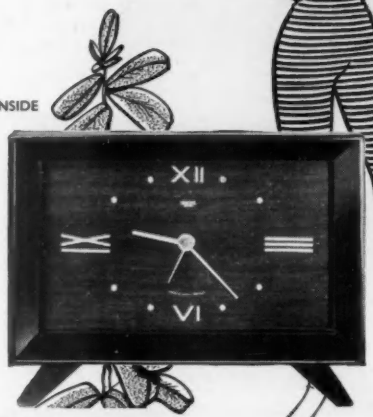

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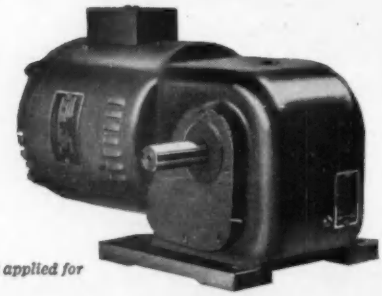

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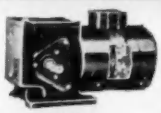

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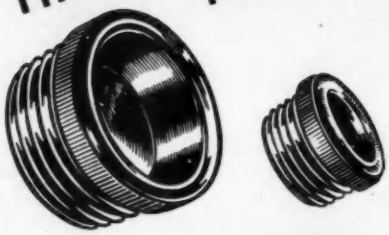

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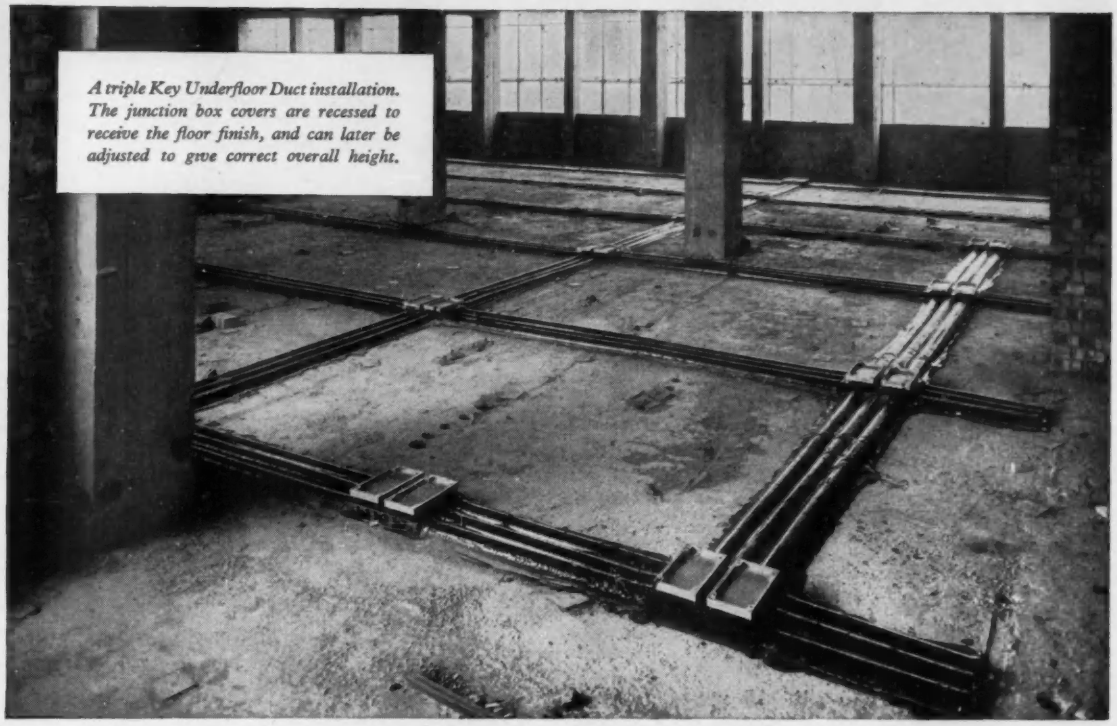

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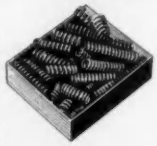

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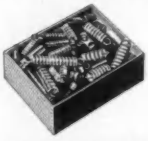

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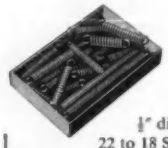

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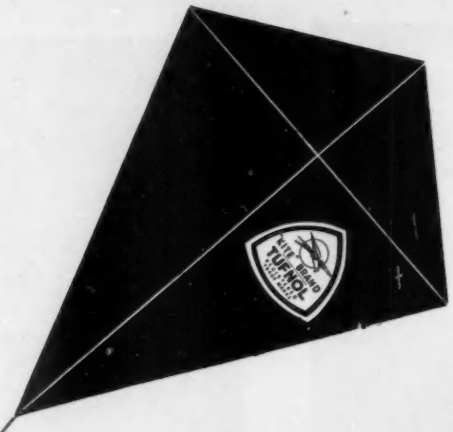

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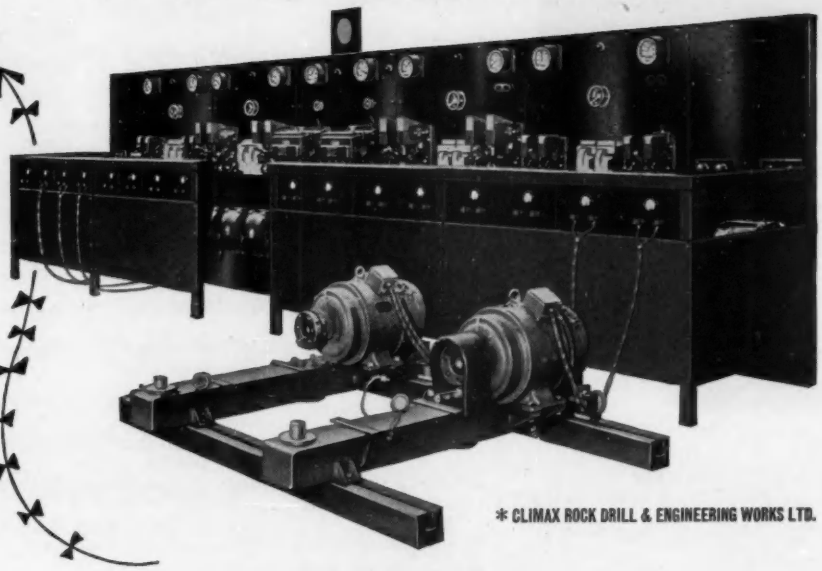

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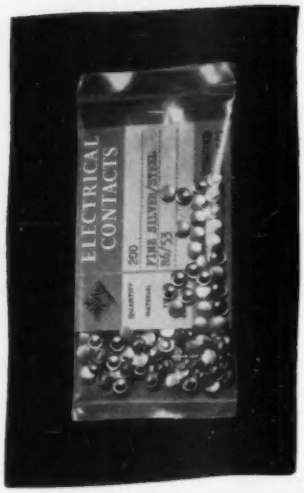

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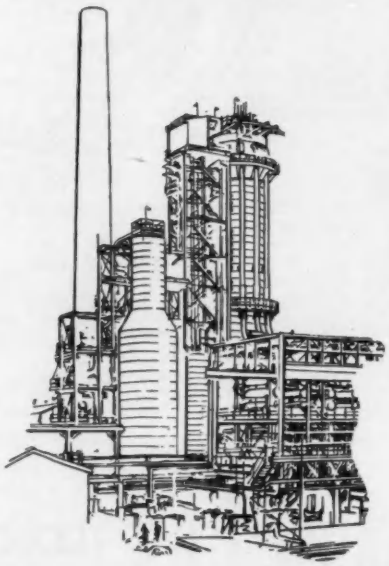

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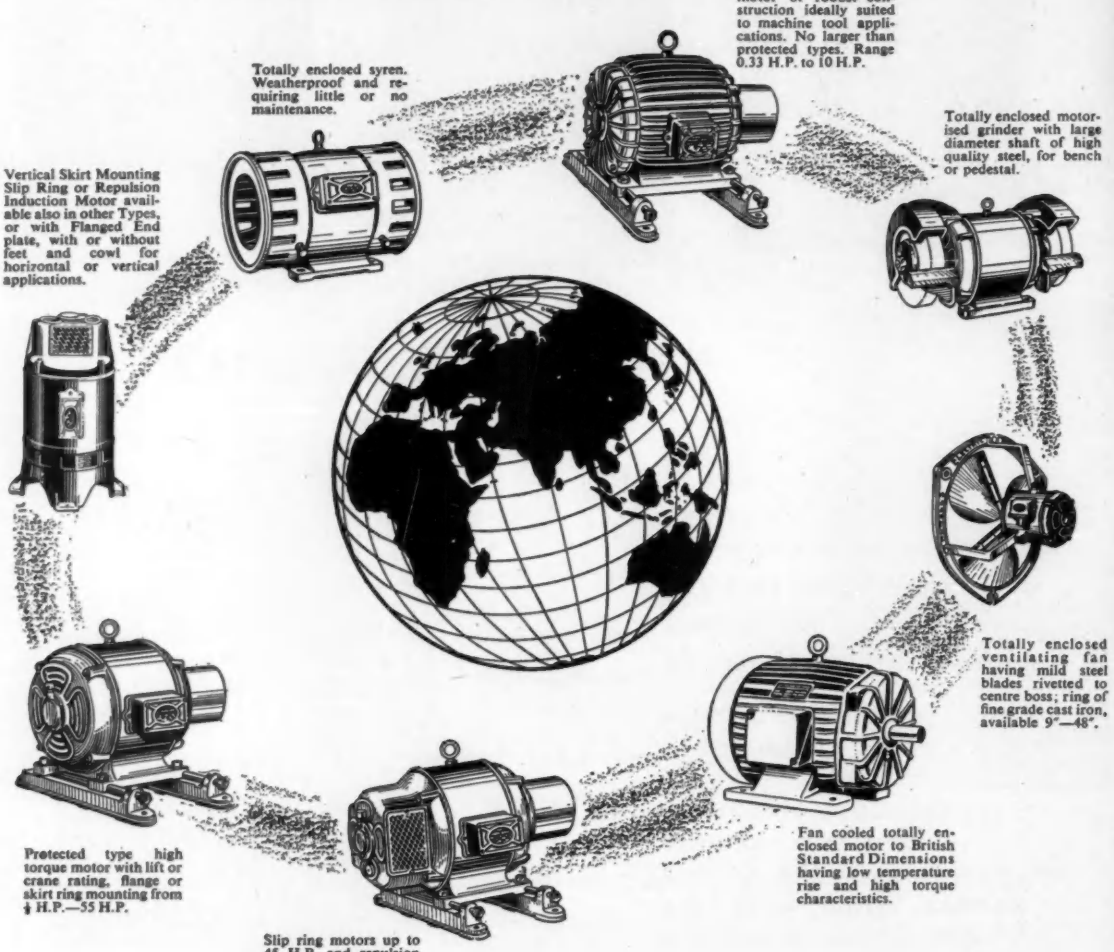
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FRIDAY
14 NOVEMBER
1958

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E. *General Editor:* J. H. COSENS *Technical Editor:* P. W. TUCKER, M.I.E.E.

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✧ ✧ ✧ ✧

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VOLUME 163 NUMBER 20 ✧ *Eighty-Sixth Year of Publication* ✧ FRIDAY PRICE 1s 6d

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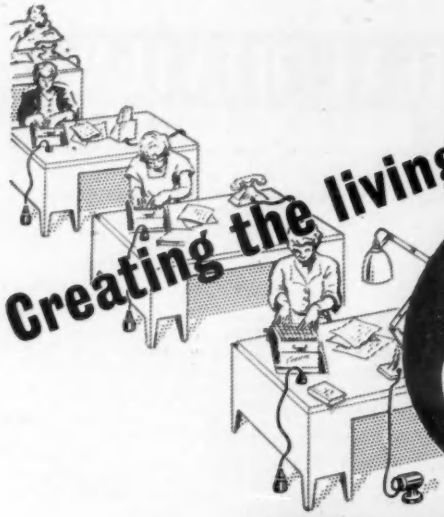

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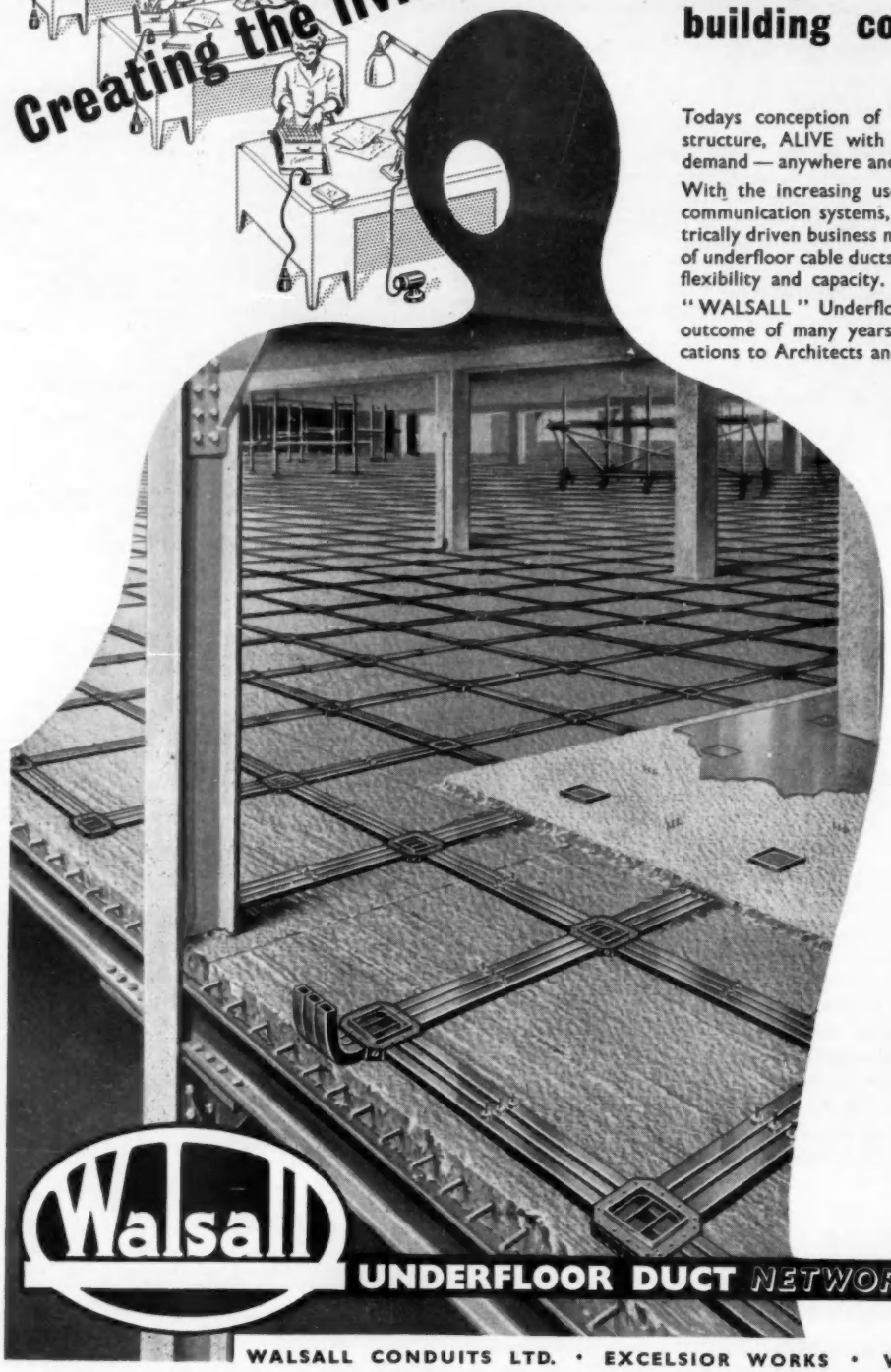

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ELECTRICAL REVIEW

14 November 1958 Vol. 163 No. 20 Established 1872

Electronics and Automation

IN his article "Electronics in the Steelworks" in this issue Mr. J. K. Edwards concludes on an optimistic note to the effect that the application of electronics will increase tremendously within the next decade and that few mill or process line control schemes will be independent of electronics. On the other hand he seems to be rather pessimistic elsewhere in the text when he says that the future of electronics in the steel industry will obviously depend on the success of the manufacturers in producing really reliable equipment. True, operating conditions in the steelworks demand exceptional powers of endurance in any electrical equipment, including driving motors, but electronic equipment generally has now attained a high reputation for reliability in many directions, including such heavy industries as paper making and textiles.

Be that as it may, we cannot agree with Mr. Edwards when he says that it is now extremely difficult to find a satisfactory definition of electronics. No doubt " the flow of electrons in vacuo " is outdated to some extent in these days, and we think " the flow of electrons in gases, vacuo and semi-conductors " might serve better; but by implication we think that all electrical engineers, at least, readily grasp the meaning of electronics, which, we feel, is far from the truth in the case of the word " automation " as it is used by Mr. Edwards, although electronics has played such a great part in bringing automatic control to its present state of very high development.

In his presidential address to the " Electronics in Automation " Convention of the British Institution of Radio Engineers last year, Mr. G. A. Marriott said that the object of the Convention was to review the ways in which the electronics industry could contribute to automation, which was one of those generic terms which were indicative rather than descriptive of a broad line of development. Again Dr. C. G. Williams in his inaugural address as chairman of the Radio and Telecommunication Section of the Institution of Electrical Engineers in 1956 (" The Electronic Age ") said that the electron was the most easily freed and the most mobile of the sub-atomic particles and the electrical profession had identified itself with it. Here again the emphasis may be on indication rather than on description, but at least the indication does induce a sound mental picture.

But to return to Mr. Edwards' article, we can more readily see eye to eye with him when he says at the outset that the introduction of electronic equipment as an integral part of a major control scheme is viewed with the utmost suspicion, largely because a certain amount of prejudice must be overcome, but in any case we feel that in presenting his article Mr. Edwards has done a good service to both the steel and the electrical industries.

BULK TARIFF REVISION

In announcing, well in advance of the date, the bulk supply tariff for 1959-60 the Central Electricity Generating Board says that it expects the same revenue as if the present tariff were continued. As this suggests that the Electricity Boards will pay the same it may be wondered why it was necessary to revise the tariff. The purpose is to relate the demand charge more nearly to the Generating Board's fixed costs and the kWh component to the Board's actual running costs.

A substantial increase in the demand charge is designed to "encourage" the Area Boards to take steps to improve their load factors so that better use will be made of the generating plant. At the same time the lowering of the secondary charge and the fuel-cost variation should have the effect of encouraging consumers to use more electricity. The decrease in the fuel-price increment is designed to pass on to the high fuel cost areas the benefits derived from the supergrid which carries electricity to them from low cost areas. The Generating Board hopes to avoid major alterations in the tariff for the next three years, unless there are unforeseen economic disturbances.

M.C.T.

The first batch of awards of the Diploma in Technology instituted by the National Council for Technological Awards was recently announced. The announcement has been quickly followed by another from the Council to the effect that it has decided to create a higher award to be gained by post-diploma study. It will take the form of membership of a College of Technologists (M.C.T.) which is to be established by the Council and will be open to diploma holders and others.

Details of the scheme are given in this issue and from these it will be seen that the programme of work to be undertaken by aspirants to membership of the College is, like the diploma course, of a "sandwich" nature. The intention is that the award shall be "a mark of outstanding distinction granted to a student who has proved his ability by completing a substantial programme of work demanding the application of his knowledge to the solution of a problem of value to industry." It is to be hoped that industrial employers will recognise the new award by giving its holders the appropriate standing.

RAILWAYS OR ROADS?

There has been renewed activity lately by the promoters of the idea to convert the British railways into high speed motorways. There are arguments in favour of this idea, but we feel that on three main counts, those of long-distance travel, safety and fuel supplies, the proposal must be discounted.

For long-distance point-to-point travel between cities, road transport generally cannot compete with rail. Recently an American company was faced with the problem of the transportation of heavy material over a distance of 50 miles. It decided that a railway system was preferable to a roadway. With regard to safety, it is obvious that railways are not so potentially dangerous as roads since traffic in opposite directions is confined to the appropriate tracks. Electrically operated automatic train control systems can be made foolproof but could not be easily applied to roadways.

The most important point is, however, concerned with fuel supplies. Oil supplies are limited but the sources of atomic energy are boundless. Therefore, apart from the improbable development of a small nuclear-powered engine, transport must eventually be powered by electricity. The most convenient and economic electric traction system is that provided by the railways which are now going ahead with their main-line electrification.

HIGH VOLTAGE D.C. TRANSMISSION

The projected cross-Channel link between the French and British power systems will operate with high voltage d.c. on the submarine cable; the terminal installations at each end of the cable will consist of conversion and inversion equipment to link the cable with the two high voltage a.c. power systems. In view of this, particular interest attaches to one of the latest British Standards (B.S.3026 : 1958), prepared under the authority of the Electrical Industry Standards Committee, which sets out the voltages already being used in h.v. d.c. transmission systems.

Readers will appreciate that it is as yet early in the development of the technique of h.v. d.c. transmission, and some may consider that it is too early, to standardise operating voltages. We feel, however, that the B.S.I. is quite right when it considers early standardisation imperative and this first step should discourage the future use of many different voltages for systems of a similar character. The voltages listed in the new standard cover all those known to be in use at the time of publication and these will be reviewed from time to time in the light of technical development and of progress in international standards.

ELECTRICAL FUNCTIONS

We have obtained the impression, cumulatively over a fairly long time, that electrical social and semi-social functions are attended more by the older men (and women) of the industry than by the younger people. This tends to create a certain quite unintentional segregation which is opposed to the very idea behind any social function and particularly those functions which have a professional background.

We suppose that in general it is easier for the older men to attend a "professional-social" function than it is for the younger ones, both by virtue of seniority and ability to get away from the office or works. Nevertheless this is the younger man's day, particularly in regard to such newer technologies as electronics and nuclear energy, and we feel that much could be done to make it possible for the younger man to have better representation.

Separate parties for the younger men might be considered, but while from the purely social aspect this might prove satisfactory we are not so sure that it meets the professional requirements. In any case we are great believers in the thorough mixing of the old and the young, and we would suggest that a tendency towards numerical equality of age groups at any function might be considered with advantage by the organisers.

Although the author mentions that electronic equipment is viewed with the utmost suspicion by steelworks engineers he is convinced that the use of electronics will increase tremendously within the next decade. He gives a wealth of information on actual and potential applications to the iron and steel industry's works processes, under such headings as energy transformation, instrumentation and control

Electronics in the Steelworks

PRESENT TRENDS AND FUTURE PROSPECTS

By J. K. EDWARDS, M.A., A.M.I.E.E.*

ONLY in the last ten years has the use of electronics become common in steelworks in this country. Even to-day the introduction of electronic equipment as an integral part of a major control scheme is viewed with the utmost suspicion. The reasons are not difficult to find.

Firstly, there is a certain amount of prejudice to be overcome. Steelworks electrical engineers have not been familiar with the technique of electronics with its high impedance input circuits, screened cables, thyratrons, dekatrons, flip-flops, multi-vibrators, long tailed pairs, etc., and the jargon used by the electronics enthusiasts has not encouraged them to forsake older, well-tried and better understood devices.

Any failure which can cause a stoppage of a continuous process is a most serious matter. For instance, electronic voltage regulators are occasionally used to control the busbar voltage on tandem hot finishing mill drives. Failure of the regulator will cause instantaneous operation of the protection equipment which will shut down the mill. Although the change-over to a standby regulator may be achieved very rapidly, the mill has to be restarted and in the meantime the hot strip, which is in all stands, has simultaneously cooled and in all probability has to be flame cut into sections before it can be removed. A mill fault stop, which is usually achieved by dynamic braking, as would be expected, causes a piling up of strip between stands, so that clearance of the mill may take quite an appreciable time. Thus a fault which itself can be eradicated in a matter of seconds can cause prolonged production delays.

Whenever the reliability of electronic equipment is discussed, valve failure is mentioned. Actually, this type of fault is not a serious one, as the sudden failure is usually a filament burn-out, which is instantly observable, and the gradual failure, i.e. a drift in the valve characteristic, should be noticed before it reaches a dangerous amount by periodic checks. Valve replacement is, moreover, a matter of a few minutes.

By far the most serious type of electronic equipment failure is that caused by a resistance or condenser breakdown or value change. This normally requires the removal of several components from the equipment, their checking and replacement: work which can only be carried out satisfactorily at the work bench and not on site. The symptoms of such faults are often most difficult to forecast so that fault finding can be a real problem and, unless duplicate equipment is available, long delays become inevitable.

Here the fault lies mainly with the equipment designers. It is only comparatively recently that a full appreciation of the necessity for reliability, of the arduous physical conditions under which the equipment must work and of the importance of providing an adequate number of test points with built-in "dummy signals" and test meters, has been obtained. Equipment is at last available in which valves are under-run and components derated with consequent long life. In addition, as more and more complicated control equipment is being installed in steelworks, conditions are gradually improving and air conditioning of motor rooms and contactor rooms has shown itself to

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A 60-phase steel tank mercury arc rectifier installation feeding a tandem hot strip finishing mill

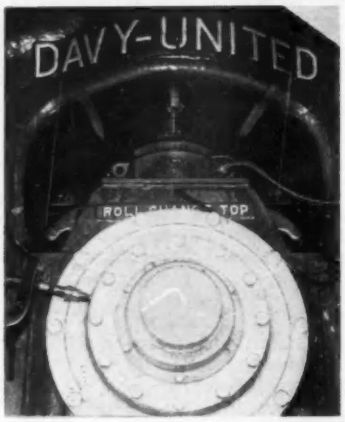
be worth while, resulting in improved reliability and less maintenance. At the same time, the electronic equipment manufacturers realise that conditions which are regarded as clean in a steelworks do not compare with those existing in the laboratory and that miniaturisation is rarely to be commended when ferric oxide dust and acid fumes are prevalent.

As in other industries, electronics can help the steelworks engineer in three ways:—

(a) in the transformation of electrical energy into other forms of energy;

(b) in instrumentation; and

(c) in control.



Load-cell inserted between back-up roll chock and mill screw to measure screw loading in tons

Many applications do not fall clearly into a particular classification and, of course, bridging the gap between instrumentation and control, which is normally filled by the human operator, gives rise to automation.

The following examples of electronics applications can only be far from comprehensive, but they may serve to indicate the way in which the steel industry is beginning to find in electronics a most versatile, diligent and healthy servant, though not one entirely divorced from teething troubles. By accepted convention, telecommunications, including closed loop television, which are extensively used, do not come under the heading of electronics and are, therefore, not included.

Energy Transformation

One of the first items of electronic equipment introduced into steelworks was the mercury arc rectifier in its glass bulb form. Direct current is used extensively in steelworks. By far the majority of overhead travelling cranes are d.c. operated as are numerous mill auxiliary drives, and generally speaking the static rectifier has replaced all other forms of constant voltage convertor. Six-phase units are usually employed at ratings varying between 250 kW or even lower up to 1 MW. The larger units are of the pumpless steel tank type and both these and glass bulb rectifiers have proved relatively trouble free. The problem of regeneration has rarely proved sufficiently large to justify the use of invertors so that resistance units are employed to cater for these reverse currents. Loading resistances are also used to limit the no-load voltage rise associated with these units.

More interesting rectifier applications are to be found in rolling mills, both hot and cold. New hot finishing mill drives usually employ multiphase grid controlled mercury arc pumpless steel tank rectifiers. In earlier installations, rectifiers were paralleled with existing generators to increase the power available for hot strip mill drives, which were on common busbar systems. Later, to reduce the fault levels on these busbar systems, individual rectifiers for each stand drive were used. This gave added advantages in that the heavy copperwork was reduced, the number of circuit-breakers reduced and, of course, increased flexibility was provided by individual voltage control of each drive. Frequently, the voltage control system adopted included electronic regulators whose high speed of response was ideally suited to the application.

Common busbar systems, however, have the advantage of enabling one or more rectifier units to be isolated in the event of failure, while permitting the mill to carry on rolling. In addition, voltage matching circuits are not required between the individual drives.

Hot strip finishing mills are non-reversing and are not required to accelerate or decelerate very often. Starting up can be accomplished under no-load conditions and deceleration by dynamic braking is permissible. The application of rectifiers to reversing drives is a much more difficult process, but examples can be found of rectifiers used for every drive from slabbing mills to tandem cold mills and to many mill auxiliaries. In this field the use of rectifiers appears to be more common in Europe than in the U.S.A.

As a rectifier is inherently a device through which current can flow in one direction only, arrangements have to be made during regenerative braking and reversal of the drive for the current flow through the rectifier to be maintained in this direction. This is done in one of three ways, viz:—

(a) by reversing the drive motor armature connections at zero current;

(b) by reversing the motor field; or

(c) by using separate rectifiers connected permanently as invertors, the change-over being effected in the rectifier control circuits.

Reasons for the use of rectifiers as opposed to rotating machinery are many, and among their advantages can be listed their high efficiency, non-contribution to fault currents on the a.c. distribution system, negligible maintenance, ease of installation, low cost of foundations and fast response to control.

Single anode rectifiers of the ignitron or excitron type

View of quantometer equipment showing the recorder on which the final analyses are charted

are very rarely used purely for the conversion of a.c., but ignitrons are frequently used for switching purposes, for example in seam welders or butt welders on process lines.

Instrumentation

It is in this field that electronics has obtained a firm footing in the steel industry. Apart from the numerous counting, high-speed recording and remote indicating instruments used mainly for temperature measurement, it is surprising to find such a number of electronic devices which in many cases have been designed specially for the industry.

One, in particular, is an extension gauge used on a temper rolling mill. Following the annealing process, the steel strip is quite soft and to give it the required physical properties the strip is rolled once more, but only a small amount of work is done on it, so that the reduction in thickness may be even less than one per cent. An accurate measurement of this reduction in thickness is required so that the degree of temper can be controlled.

The use of thickness gauges is unsatisfactory as their accuracy is inadequate so that the method adopted is to compare the outgoing and ingoing strip speeds. This could be done by passing the strip over billy rolls, but one can never be certain that there is no slippage between the rolls and the strip.

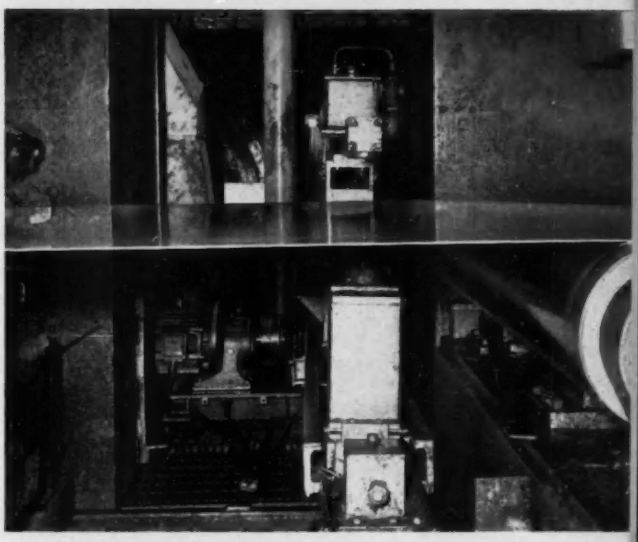
One ingenious solution to the problem utilises the strip as a magnetic tape. A magnetic pulse is applied to the ingoing strip by means of a print coil. At a fixed distance from the print coil is a pick-up coil which, as its name implies, picks up the signal. Similar coils are situated on the outgoing side of the mill but their spacing is variable. Assuming that the magnetic prints are applied simultaneously on the ingoing and outgoing sides, then the spacing of the coils on the outgoing side must be made greater than that of the ingoing coils if the picked-up signals are to be in phase. It will be appreciated that if the signals are in phase, then the ratio of the spacing of the delivery side coils to that of the entry side coils is also the ratio of the outgoing to ingoing strip velocities which gives the extension of the strip.

The extension gauge in practice is fitted with a centre zero indicating instrument calibrated in percentage "off required extension," the extension when the meter is indicating zero being given on a calibrated scale on the spacing adjustment of the delivery coils.

The main difficulty associated with this equipment is that of maintaining the steel strip sufficiently close to the imprint and pick-up units for signals of adequate strength to operate the instrument to be obtained.

A recent experimental introduction into hot strip mills is the width gauge, which should prove a most useful instrument to the hot mill operatives. This device gives a continuous indication of the width of the hot strip as it is rolled. Photocells or photo-transistors are used in servo systems which are capable of following each edge of the strip as it moves laterally, due either to a width change or to a lateral movement of the strip as a whole.

In principle, the light emitted from the hot strip is focused optically on to a narrow longitudinal slot and thence on to the photo-sensitive head, the output of which drives a servo-motor. The servo-motor moves the slot laterally until the edge of the strip is scanned. Two similar arrangements are used, one for each edge so that the distance between the slots is a measure of the strip width. To compensate for variations in the light output from the strip, due to temperature changes, presence of steam and smoke, etc., a comparison system is incorporated in which a standard is set from the light emitted from a portion of the strip at a distance from the edge.



X-ray cold strip thickness gauge mounted between stands 1 and 2 of a 3-stand tandem cold reduction mill. Photograph taken with roll coolant turned off as gauge is enveloped by steam, water and rolling lubricant when strip is rolled at speed

The main difficulty which is experienced with this type of gauge is a falling off in the sensitivity of the photocells due to the intense heat from the steel strip. Theoretically, a reduction in sensitivity should not affect the accuracy of the gauge but merely its rate of response. As the instrument is, however, used to measure the width of moving strip, a slow rate of response can of course mean a false reading during a change in width. Provided the two servo systems are identical and the deterioration of the photocells similar, a lateral movement of the strip should not produce a false reading. Temperature stabilisation of the cells is the obvious solution to the problem and water cooling is provided, but this problem proves to be more difficult that one would expect.

Other difficulties associated with this gauge are caused by heat shimmer producing an ill-defined strip edge image on the photo-transistors and, as the measurement is made on hot strip, an allowance has to be made for the contraction of the strip, which may be of the order of half an inch, on cooling.

A development of the photocell is the photomultiplier tube which finds many applications in radiation measuring devices such as non-contact thickness gauges of the X-ray, Bremsstrahlung or gamma ray types. The X-ray gauge is the oldest of these gauges and although it is perhaps the most expensive and complicated, nevertheless is not being replaced entirely by the newer nucleonic gauges. The reasons are that:—

(a) it is a simple matter to adjust the energy of the X-ray beam to suit the thickness of strip it is intended to measure, so that one can use the minimum energy radiation necessary and thereby reduce the radiation hazard to a negligible level;

(b) the X-rays can be switched off;

(c) as the gauges have been in use for many years, the teething troubles have been overcome and they are very reliable.

The chief advantage of the nucleonic gauge over the X-ray gauge is the stability of the radiation source. Apart from the natural decay of the radio-isotope which is selected to have a long half-life, the source is entirely

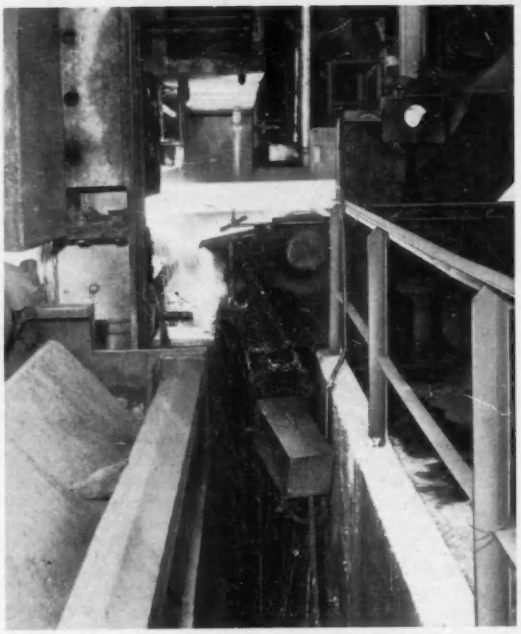
stable and unaffected by temperature, and the extensive supply stabilising circuits of the X-ray equipment are dispensed with. This advantage is not unqualified because it is impossible to stop the source radiating so that difficulties arise in providing adequate shieldng for it when it is not in use and also in ensuring that any accident on the rolling mills cannot result in sufficient damage to the source holder to free the radioactive source.

The circuitry employed for measuring the radiation varies quite considerably between manufacturers but, generally speaking, the accuracies and time constants used are of the order of 1 per cent and 1 second although, where gauges are employed for automatic rejection of off-gauge cut sheets, beta gauges of considerably shorter time constants are available. The latter gauges measure the thickness of the strip before shearing, the presence of out of tolerance strip being memorised, on low speed lines by pin-wheel timers and on higher speed lines by magnetic tape or drum, so that after shearing the off-gauge can be rejected automatically.

Practically without exception, all these thickness gauges indicate deviation in gauge from a set thickness which is selected either by means of a calibrated potentiometer or by decade switches covering tenths, hundredths and thousandths of an inch. Usually the deviation indicator is in the form of a centre zero milliammeter calibrated either in percentage or directly in thousandths of an inch. In one novel instrument which successively integrates the thickness of hot strip over periods of approximately one second, the gauge is shown on a display board by means of coloured lights. The board consists of five horizontal rows of lights mounted vertically above each other, the centre row indicating "On Gauge," the row above it "Slightly heavy to Gauge," and top row "Out of Tolerance—Heavy" and similarly the rows below the centre indicate in two stages that the strip is too thin. At the end of each integration period, a bulb in the appropriate row lights up and remains lit until it is cancelled or another strip is rolled. The result is that the operators are able to see a rough longitudinal profile of the thickness of the strip that they have rolled and are able to make any corrections necessary before the next strip is rolled.

A disadvantage of beta and gamma ray gauges is that frequently the radioactive sources available do not emit particles or rays of the most suitable energy for the measurement of the steel thickness required. A relatively new type of source is now coming into use called a Bremsstrahlung source. These rays are indistinguishable from X-rays and are generated by slowing beta particles, usually from a strontium 90 source in a suitable medium. They are generated with a wide spectrum of energies and are used for the measurement of tinplate gauges to hot strip gauges, i.e., over the range from 0·01in to 0·25in, although it must be admitted that beta rays are more suitable for the thinner gauges up to say 0·015in.

Actually the beta gauge was probably the first non-contact thickness gauge using radio-isotopes to be introduced into steelworks. The radioactive sources available give an upper limit to the thickness capable of being measured by such a gauge of approximately 0·02in so that these gauges were used for tinplate. It will be realised that the soft beta rays are absorbed by water, rolling oil and steel particles so that care has to be taken to keep the very thin windows through which the particles pass, and also the steel strip, clear of these substances. This problem, together with drift in the electronic equipment, were the two chief difficulties which had to be overcome. Later gauges are fitted with automatic standardisation equipment which corrects for build-up of extraneous matter on the gauge windows and for the slow decay of the radioactive source. Ionisation chambers are normally used for the measurement of beta particles, the ionisation current being passed through a resistance of the order of 10^{12} ohms to obtain an input signal to an electrometer valve before power amplification.



Closed loop TV camera viewing under-side of hot slab following oxy-acetylene scarfing machine. The conditions under which this unit has to work can be appreciated

A new instrument which is being introduced, and is proving a great time saver to the steelworks chemist, is the quantometer. This ingenious instrument is capable of giving a complete quantitative analysis of the main elements in a steel sample within a matter of minutes.

An arc or spark is struck on the prepared sample and the emitted light is analysed by means of a diffraction grating. The characteristic spectrum lines of the various elements in which the metallurgist is interested are directed by an optical system on to a number of photo-multipliers, the outputs of which are used to charge condensers over a standard time. By comparison of the voltages on the various condensers with that of the condenser associated with an iron line, after suitable calibration it is possible to determine the relative amounts of the various elements present. The summation of all the percentages of elements should naturally equal one hundred so that a final proportional correction gives the required answer. The separation of the lines of carbon and sulphur is a problem which it is hoped to solve by new vacuum techniques. The apparatus itself is complicated in that these operations are carried out automatically and the final analyses recorded.

In the form of load cells, strain gauges are finding increasing uses in steelworks. Apart from the more obvious applications in weighing, e.g., the contents of a bunker, they are being built into crane hooks so that the lifted load can be weighed. This, incidentally, can save a handling operation. Careful design of the load cell, which consists basically of a cylinder around which are cemented a number of strain gauges connected in the form of a Wheatstone bridge, can result in a unit which

is relatively insensitive to changes in ambient temperature. However, each application has to be thoroughly investigated. For example, when load cells are used to weigh hot slabs, due to the very considerable quantity of heat radiated from the slab, great care has to be taken to avoid uneven heating of a cell whereas a uniform heat rise over the complete cell can, to a certain extent, be tolerated. In addition, allowance must be made for the heat rise in the supporting structure, as dimensional changes can appreciably alter the effective tare weight of the structure because of changes in the friction of the guides, etc.

Load cells are now being used in rolling mills to measure the force exerted on the rolls by the screwdown mechanism. A continuous measurement is obtained during rolling and, although high accuracy is not needed, the cells have to be made very robust to prevent damage from overload. Prior to the introduction of this equipment, no satisfactory means of measuring this roll force was available. Its indication is helpful to the operators in that they are able to balance a mill, i.e., to ensure equal loading on each side of the roll, more easily, prevent overload and also receive immediate warning of any excessive eccentricity in the work or back-up rolls or wear in the bearings. Load cells are manufactured with various capacities up to 1,500 tons.

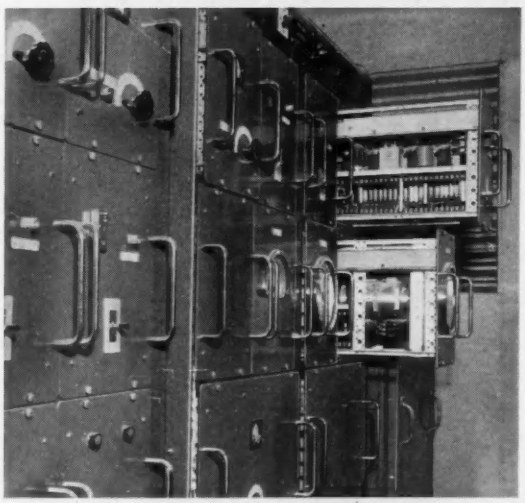
To avoid the problem of drift in d.c. amplifiers, the strain gauge bridge is supplied from an a.c. source and, where accuracy and speed of response are important, a 400 c/s supply is frequently adopted. The output from the bridge is amplified by a phase-sensitive push/pull amplifier which feeds a split field servo-motor.

The motor drives the indicator and also a potentiometer or linvar which supplies the voltage to back off the input voltage. Velocity feedback obtained from a tachogenerator driven by the servo-motor is utilised to prevent instability and overshoot so that a high gain amplifier can be used with consequent high speed of response. It will be appreciated that in such potentiometric systems the gain and linearity of the electronic amplifier are not critical.

Control

Photo-electric cells have been used for a considerable time and their application is most varied. Numerous examples exist of light beams used in conjunction with photo-electric cells as limit switches, for example, on coil conveyors, soaking pit selection for the ingot buggy, etc., and, except in extremely adverse conditions of heat and dust, they have proved very reliable.

Automatic gauge control electronic equipment showing how units can be withdrawn from rack for maintenance



The control of loops in a process line, e.g., in front of a flying shear, is practically always done by photo-electric methods. The simplest system involves two horizontal beams of light arranged one above the other so that the correct level of the bottom of the loop falls between the beams, i.e., with the top light beam broken and the bottom uninterrupted. A decrease in the length of the loop then causes the upper photocell to be energised which results in a relay being energised to speed up the pinch rolls feeding steel into the loop. Similarly, an increase in the depth of the loop causes the lower photocell to be de-energised with a consequent "dropping off" of its associated relay and a slowing down of the pinch rolls. As the equipment taking strip away from the loop runs at a constant speed, the loop length is changed by any alteration in speed of the strip being fed into the loop. Normally, four light beams are used, the top and bottom beams having a great degree of control over the pinch rolls and providing a form of back-up protection. It will be appreciated that this simple method of control, although widely used, will result in a continuous hunting of the loop between the two middle beams, as the correction afforded is only a temporary one. Other more refined control schemes incorporate permanent corrections via motor operated rheostats with consequent greater stability.

The latest form of control utilises a light source extended in the vertical plane, such as a fluorescent tube. The light from this source is focused on to a photocell or photo-transistor. As the source is partially obscured by the loop, the amplified output of the photocell is inversely proportional to the depth of the loop and is used to control the voltage applied to the pinch roll drive motor. Thus a continuous control is effected as opposed to the former "bang-bang" type of control.

The advance from continuous measurement of strip thickness to the automatic control of gauge has taken a considerable time. Now, however, various forms of automatic gauge control are being tried on cold mills and are having varying degrees of success, but so far little has been done on hot rolling mills.

On tandem cold mills, the control is usually applied in two parts, firstly by a coarse control of the screws of the first stand of the mill and, secondly, by vernier control of the speed of the final stand which makes a gauge change by altering the ingoing strip tension to that stand.

The most common system used is what is known as a "bang-bang" system. Since any gauge of the X-ray, nucleonic or contact type must of necessity be placed at some distance from the roll gap, one is faced with the fact that there is a time delay during which the steel strip moves from the roll gap to the measuring device. It is obvious that if a continuous screw correction is applied, an oscillation will result, as the screws will not receive a signal that the correction is complete until strip of the correct thickness has moved from the roll gap to the measuring device and been measured by it. During this period, the screws over-correct after which they reverse and over-correct in the opposite direction. The amount of over-correction is inversely proportional to the speed of the strip and at high speed may be negligible.

However, to stabilise the system at all speeds, it is necessary to adopt the technique of (a) measurement and detection of off gauge; (b) making a standard correction; (c) pausing for the strip to travel to the thickness gauge; and (d) repeating the process. It is customary to employ

a " gate " or dead zone to give a tolerance on each side of the required thickness before applying a correction. Should the thickness be considerably at fault, then the screws are often allowed to run continuously until the strip becomes fairly near the thickness called for, after which the above pulsing method is used to bring the strip thickness error finally into the dead zone.

It can be seen that such a system is far from ideal in that either one must accept strip continuously varying in gauge due to the velocity-distance effect, or utilise a control system which is inactive for an appreciable period. This is overcome by a method of thickness measurement devised by the British Iron and Steel Research Association, by which measurement is carried out actually in the roll gap. If one can determine the amount by which the mill housing is stretched by the force exerted on the rolls by the strip, and add to it the unstressed roll gap, one can obtain to a first approximation the true roll gap and, therefore, the strip thickness under rolling conditions. Load cells give the load on each screw and consequently a measure of the housing stretch which, over a large range of loads, obeys Hooke's Law, while the amount by which the screws have rotated up or down from the point where the rolls just touch each other, gives a measure of the unstressed roll gap. Roll deformation can normally be ignored, but a correction has to be applied for speed-dependent variations in the thickness of the oil film in the back-up roll bearings, and if excessive loads are used, an additional correction has to be applied for the change in thickness of the oil film due to load. In addition, temperature changes and roll wear can affect the gauge meter, as it is called, so that although it has a good short term stability, its long term stability is not good. For this reason, if a gauge meter is used as the primary thickness measuring device for an automatic gauge control system, a second thickness gauge of proved stability is employed to correct for any drift.

The amount of electronic equipment associated with automatic gauge control systems is quite large, though not particularly complicated, and it is, of course, directly connected with the mill screwdown equipment or, if tension control is used, with the stand speed control circuits.

Space obviously has not permitted more than a very brief description of a few of the electronic applications to be found in modern steelworks containing hot and cold strip, sheet and tinplate mills. Thyratron applications, such as the control of tension on pay off and winding reels, for example, have not been included.

The Future

The two fundamental requisites of any electrical control scheme are that it should be simple and reliable. Nowadays, of course, schemes have increased immensely in complexity. This has been unavoidable, but nevertheless the steelworks engineer is quick to eliminate any unnecessary circuitry and requires much persuasion before agreeing to the adoption of any new and unproved equipment, the failure of which could stop production. If there is the slightest doubt concerning the reliability of a certain type of equipment then that equipment will be installed only if there is no alternative.

At present, electronic equipment falls into this category and, apart from its use for instrumentation and power rectification, it is not used from choice. The future of electronics in the steel industry obviously will depend on the success of the manufacturers in producing really reliable equipment, and the designers in producing circuits in which component values are not critical. Many examples exist of complicated electronic equipment, e.g., closed loop television cameras and monitors, working for long periods under the most adverse conditions and giving little trouble, which prove that well-designed equipment can stand up to the conditions prevailing in a steelworks. Moreover, such examples do much to persuade the steelworks engineer that electronic equipment failures can often be attributed to faulty application rather than to failure of the equipment itself. The continual demand for increased production, and improved tolerances and quality, gives rise to a need for further instrumentation, more accurate and faster responding control circuits and a fundamental knowledge of the processes involved. The last is an essential before automation can be attempted and, although a great quantity of data is available, it is rarely in a form suitable for rapid analysis. It is in these fields that electronics and electronic techniques are established. Electronic techniques are not, of course, restricted to the use of vacuum tubes but include magnetic amplifiers, transistors, static switches and other devices which are as yet in the early development stages.

It has long since been recognised that the definition of electronics involving " the flow of electrons in vacuo " is inadequate, but to find a satisfactory definition of electronics is now extremely difficult. Techniques originally developed by electronics engineers have been applied to so many problems that one frequently finds an electronics engineer employed on equipment which does not include a single valve, but for which his training makes him most suitable.

Remote position control of the screws of primary and roughing mills has been applied in many instances, especially in America, as a first step towards automation. As yet, on only a few mills are punched card or tape systems used to control the screw position, entry and delivery rolls, the manipulators and the mill speed, but it is likely that the use of this technique will spread to other mills and processes. At present, data recording is carried out independently. The logical development would appear to be, firstly, to log a larger variety and quantity of data and to employ more sophisticated methods for data analysis; secondly, to employ computers to calculate performance; and, thirdly, to close the loop by utilising the computed information to modify the programme and to control the processes automatically. This procedure can of course be applied universally. From a technical viewpoint, the possibilities of automatic programming and control are immense, but whether they can be justified financially is another matter.

The future will be affected to a large extent by the maintenance problems associated with the new equipment. It is not easy to foresee the best type of organisation within a steelworks which must be set up to cater for this problem. Once any equipment of a highly specialist nature is included in the control of a process, one can be faced with employing a sufficient number of specialist maintenance men to provide a twenty-four hour per day coverage for the equipment, although the amount of equipment installed may not justify the number of technicians involved. Ideally, any such equipment should be constructed on a unit principle, each unit being readily replaceable by a non-specialist and the equipment as a whole having sufficient built-in fault finding apparatus to enable the faulty unit to be determined. In this way it would seem possible to provide adequate maintenance coverage with the minimum of specialist personnel and at the same time enable preventive maintenance to be carried out without requiring a plant shut-down. Faulty equipment could also be checked in the workshop. Yet another advantage would be that the number of different maintenance tradesmen, at the call of the mill or process line operator, would be kept to the minimum.

Many examples exist of attempts to make a process automatic by the "black box" technique. They have met with varying degrees of success but rarely can they be said to be entirely successful. A frequently quoted example is that of the replacement during the last war of an optical bombsight by a radar device, the latter being used to feed information into the same computer as the former. The anticipated improvement in accuracy was not achieved because the character of the information delivered by the electronic radar device was not completely compatible with that required by the mechanical computer. It is interesting to note that the radar manufacturers then designed a new computer which gave a satisfactory automatic bombing device and the computer manufacturers entered the electronics field and developed a radar device which in conjunction with their computer was also satisfactory. Perhaps even more interesting is that the equipment finally produced by the radar manufacturers contained more gears and mechanics and fewer valves than that produced by the computer manufacturer. But the important point is that great care has to be taken when one attempts to add automatic equipment to existing machinery.

Ideally, then, if automation is being contemplated, it is very necessary that the process as a whole shall be studied and care must be taken to avoid assuming that the addition of various devices, each of which may be satisfactory in itself, will combine to produce a satisfactory whole.

When a new mill or process line is being designed, if it is intended to be run entirely automatically its control should govern the mechanical design which might involve radical changes compared with existing lines under the control of operators. One has only to think of present tandem cold rolling mills in terms of the old pack mills to appreciate the changes which can be involved.

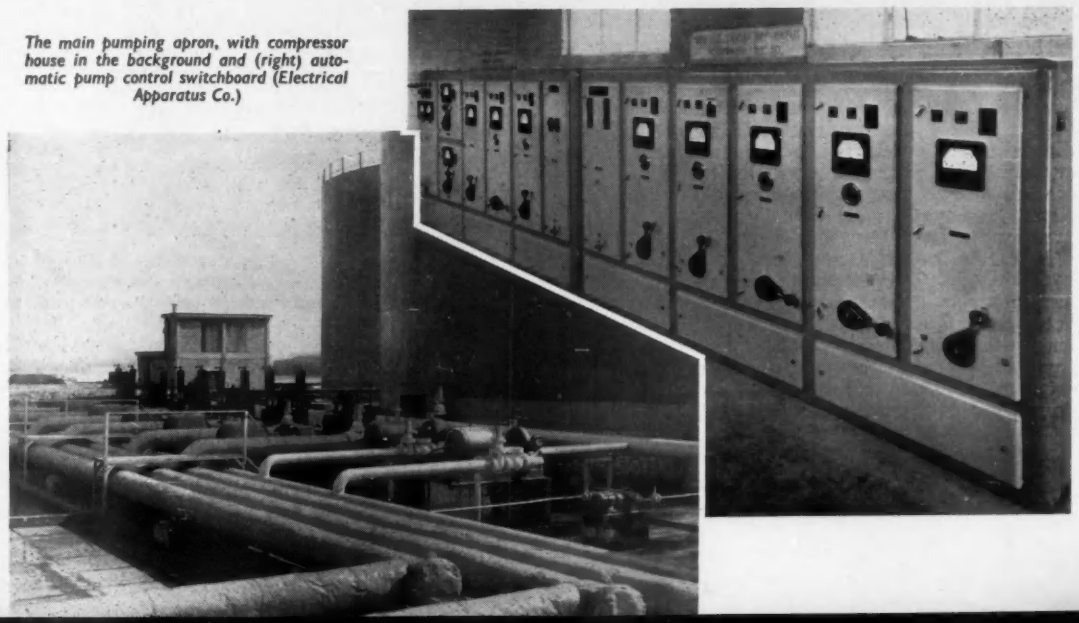
It seems certain that the use of electronics will increase tremendously within the next decade and if magnetic amplifiers and static switches can be included under the heading of electronics, then one can say with reasonable certainty that few mill or process line control schemes will be independent of electronics.

FUEL OIL TERMINAL

AN oil storage depot has been opened at Poplar by Charrington, Gardner, Locket & Co., Ltd., providing a conveniently situated terminal for their lorries delivering "Mobil" fuel oils to consumers in the London area. The depot, built on the site of the old Poplar Dock, covers over four acres with a further six available for development.

Oil is brought by barge from Coryton refinery and unloaded at the 700ft long quay, two 120 and one 54 ton/hr Mirrlees pumps driven by 40 or 15 h.p. English Electric motors being installed to pump the oil into the four storage tanks. Eight pumps are used to transfer the oil to the vehicle loading bays. Three pairs of 600 gal/min positive displacement pumps, manufactured by Plenty & Son, Ltd., and driven through Croft 5·67 : 1 reduction gears by 75 h.p. 960 r.p.m. Crompton Parkinson motors arranged for direct-on-line starting, handle the three grades of black oil, while two 500 gal/min Lee Howl pumps with 30 h.p. 1,465 r.p.m. C.P. motors deal with gas oil. Under normal conditions these pumps are started automatically when oil is required at the loading bay, although overriding manual control is provided. A pressure held by the positive displacement pumps in the oil pipes to the loading bay is balanced with that maintained in a hydraulic control system by gravity-operated hydraulic accumulators. When a loading bay valve is opened the ensuing drop in the oil pipe pressure is transferred to the accumulator, which is allowed to fall, closing limit switches and causing one of the pump motors to be started. The second of the pair of pumps is automatically started if a greater quantity of oil than can be supplied by one pump is required. A switch mounted on the control panel selects the pump starting order, reversed at 50 hr intervals. A time switch is included to prevent simultaneous starting of all motors should the accumulators fall through a fault occurring in the control system, the motors being started at a minimum interval of one minute.

Two 600 cu ft/min "Broomwade" compressors driven by 136 h.p. 310 r.p.m. English Electric motors provide air at 100 p.s.i. for pipeline and barge cleaning. For fire prevention low pressure air can be introduced into the bottom of the storage tanks, circulating the oil and dropping the surface temperature below vaporisation level. The depot is completed with a vehicle washdown plant and an administration block with Telex communication to Charrington's head office and Coryton refinery. The architects for the depot were A. F. Hare & Partners, and the main contractors Leonard Fairclough, Ltd.



The main pumping apron, with compressor house in the background and (right) automatic pump control switchboard (Electrical Apparatus Co.)

Digital Computers

I.E.E. DISCUSSION ON TRANSISTOR UNITS

THE discussion on the two papers on digital computers* presented at last week's meeting of the Measurement and Control Section of the Institution of Electrical Engineers was opened by Dr. G. B. B. Chaplin (A.E.R.E., Harwell). Referring to the paper by Barnes and Stephen, he said that point-contact transistors had a reputation for being somewhat unreliable, but, apart from teething troubles, the authors had found them more reliable than valves. The point-contact transistor had first been produced about six years ago and had not been altered much since then, but, although unprecedented efforts had gone into the development of junction transistors, the authors had had trouble in finding junction transistors to replace their point-contact transistors.

On Mr. Eldridge's paper, Dr. Chaplin said that at the A.E.R.E. they had had to design a very fast computer element using h.f. transistors and, since the whole emphasis was on speed, they had used transformers of a similar type to the author's and in a similar way, which produced voltages which were added up by analogue principles. It had been found that as the number of windings was increased the speed of operation of the circuit must be decreased. With nine inputs it was necessary to wait until the inputs had reached 95 per cent of the final value, and if the input waveform had a curve on it, it was necessary to wait a very long time before reaching 95 per cent of its final value.

Experience at Manchester

Dr. R. L. Grimsdale (Manchester University), on the paper by Barnes and Stephen, referred to a similar machine built at Manchester which was characterised by extreme flatness, being almost two-dimensional. It had used point-contact transistors, and with about 200 in the machine there had been trouble with about two every week. These had not been complete failures, but there had been reluctance to turn "off" or to remain in the "off" state. Two batches, each of about 200, had been tested before going into the machine, both supplied in 1953, and the second showed a marked improvement. Unfortunately, the improvement had not been maintained, and he wondered whether better results would have been obtained with better hermetic sealing. It seemed a pity that an excellent device such as the point-contact transistor had not received anything like the attention given to the junction transistor. With point contact, a single transistor could be used in a two-stage circuit, making it possible to build a machine with very few transistors in it.

Mr. J. A. Bailey (Metropolitan-Vickers) said that in 1955 his firm had decided to proceed with the development of a point-contact transistor machine, having about 300 transistors together with a number of valves, used mainly for basic waveform distributions. On receipt from the manufacturers, about 10 per cent of the transistors had been rejected, and on switching on some 20 per cent were found to have failed. Once the initial test had been completed the rejection rate dropped to 2¼ per cent per month, and later to 1 per cent.

In August, 1957, it had been decided to convert the machine to use junction transistors, the replacement rate being about 3½/1, so that there were 1,100 transistors in the converted model. The machine had been in operation for some nine months and during that time there had been three failures.

Mr. J. B. Bunt (Elliott Bros.) said that more information on how to deal with errors which arose in the machine would be welcome. According to Barnes and Stephen, their machine was marginally tested for 30 minutes a day. Marginal testing was useful to improve design values and detect initial mistakes, but he doubted its value as a routine maintenance method. The authors stated that the minimum acceptable condition was an error-free run of at least thirty minutes under marginal conditions. If the correct margins were applied to the machine, an isolated error in 30 minutes would suggest that under normal conditions the machine would be reliable. It was unfortunate that in transistor circuits it was only voltages that could be varied; the application of margins to frequency or temperature might well be more effective in preventing breakdowns in practice.

Mr. R. Williams (Ferranti), dealing with Mr. Eldridge's paper, said that a relatively large number of core logical devices had made their appearance in the last eight years, and many people were interested in comparing one type with another. It was felt that a wound core was likely to be more reliable than a collection of diodes.

Replying to the discussion, Mr. Barnes said that recent experience with their computer had been very satisfactory, and last month they had had 98 per cent availability. Hermetically-sealed point-contact transistors had been very reliable, and if development of this type had been continued it could have been a very useful device. Despite what Mr. Bunt had said, any failure during the marginal test was significant and could lead to the identification of a sub-standard element somewhere in the computer.

Mr. Eldridge replied briefly to the discussion on his paper, and the chairman, in summing up, commented on the amount of energy and ingenuity used by designers in circumventing the deficiencies of materials and components and wondered whether some of it might not with advantage be diverted to improving the characteristics of ferrites in particular. Developments in the transistor field were taking place so rapidly that tests of their reliability tended to be out of date before the paper describing them was published and, despite certain pious hopes which had been expressed, point-contact transistors appeared to be on the way out, while improvements were being made almost daily in junction transistors.

* See *Electrical Review*, 7th November, pages 871-2.

Instrumentation Symposium

A JOINT symposium on Instrumentation and Computation in Process Development and Plant Design is to be held at the Central Hall, Westminster, London, S.W.1, from 11th to 13th May, 1959. It will be organised by the Institution of Chemical Engineers, the Society of Instrument Technology, and the British Computer Society, under the ægis of the British Conference on Automation and Computation. Morning and afternoon sessions will be devoted to "Improving the Efficiency of Existing Processes"; "Design of New Processes"; "Application of On-Line Computers"; "Recent Developments in Instruments, On-Line Computers and Computers for Design"; and "Use of Computer Techniques in Large and Small Companies."

Further particulars and booking forms can be obtained from the General Secretary, Institution of Chemical Engineers, 16, Belgrave Square, London, S.W.1.

Off-Peak Statistics

A PLEA FOR MORE INFORMATION

Attention is drawn to the disparity between the amount of publicity on load-factor improvement and the lack of information on the pattern of off-peak consumption. The development of thermal storage heating, in particular, makes it desirable that the Area Electricity Boards should not delay in providing regular statistics of the capacity and consumption of their off-peak loads

HARDLY a week passes without a member of the supply industry urging the need for an increased consumption of electricity during off-peak hours and for the development of the sales of those appliances that will automatically increase the load factor. These individual pronouncements have been supported at both national and local levels by publicity campaigns conducted by the British Electrical Development Association and the Electricity Boards which have aimed at showing industrialists and the public the advantages of taking supplies on an off-peak or restricted-hour tariff or of otherwise improving their load factor. Conferences on the techniques and applications of thermal storage heating have been arranged in many parts of the country for architects, builders and officials of local authorities, and innumerable descriptions of actual installations have been published.

That these efforts have met with no little success is shown by the sales of block storage heaters which alone during the past eight years have probably amounted to a capacity of 250 MW, and by the total installed capacity of one type of storage water heater which is said to be around 350 MW. As a measure of the substantial progress made in developing specifically off-peak consumption, it may be recalled that the recently published survey of the commercial load gave the proportion of thermal storage installations in 1953 as "still negligible." On the other hand, the installed capacity of thermal storage heating systems is still small compared with that of direct space heating appliances which for domestic premises alone was estimated in 1955 at over 17,000 MW.

Though there is a gratifying tendency for the overall load factor of the system to improve as consumption grows, the disparity between the peak and minimum loads is now of even greater concern to the industry due to the need to provide an adequate base load for the efficient operation of nuclear power stations. Under the present programme nuclear power stations will be able to supply the whole of the estimated base load in seven years' time. It is clear, therefore, that the rate of growth of the base load can affect both the future rate of provision of nuclear power stations of the present type and also the promise of cheaper electricity.

Annual Reports Disappointing

In view of the obvious importance of guiding consumption away from the peaks, it might have been expected that the subject would have figured largely in the latest Central Electricity and Area Board annual reports. But this was not so, and more than a passing reference is exceptional. In less than half the Area Board reports does the off-peak load merit the distinction of a sub-heading and in others a diligent search reveals only statements such as:—The Board are concentrating their sales effort on those appliances offering the best load development; that publicity was carried out on off-peak heating; that the installation of thermal storage systems was encouraging; or that comparative tests are being carried out on thermal storage and direct heating installations. Even the available off-peak tariffs are not always mentioned.

More helpful are the occasional and isolated references to the installation of new thermal storage systems. From last year's reports it is learnt that in London the "total load of block storage heaters now exceeds 18 MW" and that heaters of this type totalling 9 MW were installed last year by the North Western Board. A study of the last two reports of the South Western Board reveals that nearly 13 MW of thermal storage has been installed in three years. In the North East 4 MW of thermal storage was installed last year and one factory alone will eventually have a floor warming load of 5 MW. The 2 MW of floor warming installed last year by the Eastern Board was an increase of 22 per cent on the previous year. The figures which this Board gave in their 1956-57 report for the sales of block storage heaters have regrettably not been continued. Since it is obvious that the Area Boards must be greatly concerned to increase the use of their assets by improving their load factors, it is unfortunate that the space devoted to this subject, compared with that given to other topics, should give such a misleading impression.

Private Inquiry

It is true that the figures in the annual reports can be supplemented from other published statements and by private inquiry; but even so the available material is meagre. As already mentioned in these columns, Mr. W. S. Lewis, chairman of the Midlands Board, has said that 25 million kWh was sold for thermal storage purposes in his area last winter. The installed load was: floor warming 18 MW, block heaters 14 MW, and water storage 2·8 MW. The chief commercial officers of three Boards have kindly provided us with additional details of the position in their areas. Mr. E. H. Skinner has estimated that the 10 MW of block storage heaters and floor warming installations in the South Eastern Area used 12 million kWh during the last heating season. In the Yorkshire Board's area, Mr. A. Haselhurst tells us, the installed loads at 31st March, 1958, of floor warming, block storage heaters and water storage were respectively 2·4 MW, 13·4 MW and 2·9 MW.

As might be expected from the lead they have given in this direction, the most complete information is available from the South of Scotland Board. Mr. J. W. Moule, the chief commercial officer, informs us that the installed load last March for floor warming was 6·6 MW, for block storage heaters 35·9 MW and for water storage 21·9 MW. In addition, there was 29·7 MW of other

off-peak space and water heating. The amount of electricity supplied on off-peak tariffs during the previous twelve months was 141·8 million kWh, but this included supplies to some 41 MW of furnaces and other industrial plant. The Board also have an off-peak heating load of over 1,000 kW in their own premises.

No Common Basis

It will be immediately apparent that the usefulness of even these few figures is seriously restricted by the lack of a common basis of calculation. Accordingly, it cannot be too strongly stressed that it would be quite wrong and unfair to use them as a measure of the relative enterprise of different Area Boards in this field. To begin with not all the installations are made by or with the knowledge of the Boards. Again, though all the Boards now publish off-peak tariffs or offer "special arrangements," there are many cases where it is equally advantageous for a supply for a thermal storage system to be taken under an existing tariff. A good example is a factory with a high maximum demand which is already paying for electricity at the lowest follow-on rate. Here there is usually no record of the consumption of the thermal storage system and the Board often appear to have no knowledge of the capacity installed. There may be a similar lack of precise information where the tariff includes a block of low-priced units to cover the estimated consumption for thermal storage purposes. The large number of thermal storage installations which do not take supplies under an off-peak tariff is not generally realised. It has been estimated that those supplied on such tariffs through separate meters, and therefore presumably having a known capacity and recordable consumption, represent no more than 50 per cent of the total.

It is clear, therefore, that the compilation of accurate figures for the growth of thermal storage installations will be no easy matter. But we believe it is a task that is well worth undertaking and it is desirable that the start should not be too long delayed. The Area Boards are obviously in the best position to obtain and record the necessary information, and in view of its value it is surely astonishing that greater efforts have not already been made in this direction. It would appear that the rate of development has taken some Boards by surprise. If the figures are to be fully comprehensive the co-operation of contractors and manufacturers will be required. But even if this is not possible, regular details of the installations and consumption known to the Boards would probably be an adequate measure of progress. The useful figures for the sales of appliances by the Boards, which should surely also include block storage heaters, are a precedent for providing statistics covering only a part of the industry.

Benefits to Industry

In the past the industry has suffered from a lack of knowledge of the pattern of consumption. It is probable, for example, that much of the damaging criticism of the use of electric fires as unwanted contributors to the peak load in the immediate post-war years could have been immediately and therefore more effectively answered if adequate statistics of their use had been available.

The opposition to electrical development which came fully into the open at that time is still powerful, if less in evidence, and it cannot be certain that the industry's forceful entry into the space heating field will not touch off further criticisms of its policies that may prove difficult to answer unless the right sort of information is to hand. In the promotion of thermal storage heating it is also desirable to be able to quote authoritatively the extent to which it is already being used. We have heard it said too often that floor warming is still experimental and that there is too little experience to warrant its adoption. Within the industry, it would be useful to know more about the relative contributions to the improvement of the load factor of a general growth in consumption and of specific off-peak uses. Again, although thermal storage can do much to improve the system load factor it has a low diversity and it is doubtful whether enough is known of the extent to which its widespread use may require expensive reinforcement of local distribution systems.

The answer may be given that all this information, and more, will eventually become available through the Electricity Council's consumer surveys, but the value of these is considerably reduced by the delay in publication. They are, in any case, not a substitute for regular statistics. At the moment much time is being wasted in individual and duplicated efforts to obtain accurate and up-to-date figures of the growth of the thermal storage and other off-peak loads. We believe that the industry would benefit from the regular provision of this information, and that one of the major difficulties would be overcome if the Area Boards could agree to a method of compilation and presentation. The South of Scotland Board's publication in its annual report of figures for consumption on off-peak tariffs is a lead to be followed and extended.

Practical Training for Electrical Engineers

THE Council of the Institution of Electrical Engineers has for some time been concerned because the plans to expand the industrial training of professional engineers have not kept pace with the Government's programme of expansion of the universities and technical colleges to increase the number of technologists. It has been said that if the technical colleges continue to expand at the present rate they will succeed in providing their share of the extra 10,000 technologists per year which it is estimated will be needed by 1970. This would be, in the words of the Advisory Council on Scientific Policy, "a remarkable educational achievement." In the past, the burden of the complementary industrial training has fallen almost entirely upon the large manufacturing firms and the operating organisations which have now reached the limit of their training capacity.

If a substantial increase is to be obtained in the number of engineers who receive adequate industrial training in electrical engineering, then means must be found to provide such training facilities in the smaller and particularly in the more specialised firms in the electrical engineering industry and in those concerned in the utilisation of electrical power. Many of these concerns cannot provide the breadth of training which is necessary within their own organisation and, in the hope that means may be found for providing co-operative effort in the provision of such training, the Council has decided to arrange for a conference to be held on 21st November, when the matter may be fully discussed.

Physical Society Exhibition

THE 1959 Exhibition of Scientific Instruments and Apparatus, organised by the Physical Society, will be held from 19th to 22nd January next at the Royal Horticultural Society's Old and New Halls, Westminster, London, S.W.1. The opening ceremony will be performed by Sir Cyril Hinshelwood, F.R.S., and during the run of the exhibition a number of demonstration-lectures will be given.

VIEWS on the NEWS

By REFLECTOR

LAST Sunday the *Observer* published a letter headed "Constant Hot Water" in which the writer sets out to "explode the fallacy" that to maintain temperature is to save money. He rightly points out that no matter what the heating system is, or how good the insulation, heat energy must be supplied and this costs money. He particularly singles out electric immersion heaters controlled by thermostats and says that it is cheaper to switch on an hour or so before the water is needed and afterwards switch off, even if the water gets cold. All this is true, but what becomes of the "constant hot water"? If it does cost a bit more it is better to leave it to the thermostat than to live in constant anxiety about the state of the water.

* * *

The *Huddersfield Daily Examiner* reports an address by Mr. D. Bellamy, chairman of the Yorkshire Electricity Board, to the Area Consultative Council, under the heading "N-Power to Bring New YEB Tariff System?" It is true that Mr. Bellamy referred to the advent of nuclear power in two or three years' time, but apparently he did this only to stress the need for a better balance between the fixed and running charges of the consumers' tariffs. A readjustment of the tariff system was already being considered and there might be an announcement very shortly. The revision of the bulk supply tariff to the Electricity Boards is aimed at penalising low load factor and the Boards in turn will have to do something about it. Nuclear stations with their high capital charges and comparatively low running costs will underline the need for some adjustment of tariffs on the lines indicated.

* * *

I referred last week to the swans of Romney Marsh which are the frequent cause of power stoppages. It has been suggested that the birds should be thinned out, but at a meeting of the New Romney Town Council a member pointed out that the swan was a protected bird and there was a £25 fine for killing one, under the Wild Birds Protection Act, 1954. He said that it was also a popular bird and was first brought to this country in 1190 by Richard I from Cyprus. It has become rather unpopular in Romney Marsh. Another member suggested that some of the eggs might be removed from swans' nests, but it was said that there were heavy penalties for this too. Suggestions from the Home Office are still awaited by the Council.

* * *

Panorama, a regular B.B.C. programme, indulged this week in a little "commercial" television. Mr. Woodrow Wyatt was dealing with ways in which British exporters were falling short of the requirements, but he also introduced some instances of meritorious enterprise. One company whose methods were praised was Lec Refrigeration, Ltd., which regularly uses an aeroplane for its export business, taking members of the company to overseas markets, bringing over representatives of foreign buyers and flying out spare parts which are urgently required.

* * *

A lady writing to the *Evening Herald* (Dublin) notices with "disgust and regret" advertisements put out by the Electricity Supply Board showing "the Prince of Darkness warming himself by an electric fire." This appears to her to be a very unsuitable and unseemly theme for a Christian country, but it looks like coals to Newcastle to me.

* * *

Live Lines, the official journal of the Electrical Supply Authorities' Association of New Zealand, asked in a recent issue "Just What is a Pie-cart?" and then went on somewhat cryptically to say:—

> "At a recent meeting of engineers in the Central Region some agreed that it was a 'portable appliance,' others said that while it might have been once, by the new Amendment No. 5 to the Electrical Wiring Regulations, if the flexible cable used was greater than 0·007 sq in, it now was not. The definitions quoted in Consolidation of Interpretations No. 64 prevented it being called a 'caravan' so what was it?"

Although there is no enlightenment in the article, I imagine a pie-cart to be something like one of our ice-cream vans—an electric one.

Further on in the same article "offal cookers for hydatids" are referred to as having potential fire risk. My *Concise Oxford Dictionary* defines a hydatid as:—"Cyst containing watery fluid, morbid formation (esp. one formed by, and containing, a tape-worm larva)." I have no idea where the offal cooker comes in.

* * *

Going back eighty years I find that the *Electrical Review* of 15th November, 1878, contained a portrait and biography of David Edwin Hughes, the inventor of one of the earliest printing telegraph systems and of the microphone. Hughes was born in London, but was taken to America as a child by his father. He had a musical talent and in 1850 was made professor of music at the College of Bardstown, Kentucky. His spare time was spent in scientific pursuits and to such purpose that he was also appointed professor of natural philosophy at the College. In devising his telegraph he found difficulty in synchronising his sending and receiving instruments but, the *Review* said:—

> "Here his knowledge of acoustics helped him. Centrifugal governors and pendulums would not do, and he tried vibrators, such as piano-strings and tuning-forks. He at last found what he wanted in two darning needles borrowed from an old lady in the house in which he lived. These steel rods fixed at one end vibrated with equal periods, and could be utilised in such a way that the printing wheel could be corrected into absolute synchronism by each signal current."

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

From Sir Oliver Lyle

Private Generation and Public Supply

I THINK Mr. F. P. Jefferies (31st October issue) has misunderstood. During maximum demand hours bought power will always cost more than 1·4d/kWh. The maximum demand charge must be spread over 60 hours a week —not 130. The lowest maximum demand charge for each kWh occurs when it is continuously imported during all maximum demand hours, and is

$$\frac{11/6 \times 12}{51 \times 5 \times 12} = 0{\cdot}53\text{d.}$$

If the current is imported for only a few hours, the charge may be many shillings per kWh.

Depreciation and interest were included in my figures and the 650 p.s.i. boilers were installed 20 years ago.

London, E.C.3. OLIVER LYLE.

"An Architect's Approach to Floor Warming"

I READ with great interest the article in your 31st October issue by Mr. R. Baden Hellard on the above subject. There is so much in this very excellent article with which I and my fellow contractors would agree that I hesitate to call attention to one aspect of it with which I disagree.

Mr. Baden Hellard suggests that in very few instances, if at all, is the extra cost of fitting a withdrawable system justified. In my view, exactly the opposite is true. Structural changes in a building, due to slight subsidence, vibration and even the use of pneumatic drills during alteration, can, in my opinion, cause damage to either mineral-insulated conductors or those employing no composite metal sheathing when they are embedded directly into the building structure.

We have had little experience of ageing with this relatively new form of electric heating, but the life of any electrical installation is by no means indefinite, and one might confidently expect to replace the system at least once during the normal life of a building. Mr. Baden Hellard's figures for cost of repair seem to me to take no account of the disturbance and inconvenience occasioned by carrying out this operation, particularly if the building is occupied.

One other important point which seems to have been overlooked is that tenants and others, despite warnings, constantly cut holes in floors for one reason or another; this may be for the installation of a telephone point to a desk, for the provision of a door closer, or even to fix a piece of furniture to the floor, and my experience is that, if it is possible to do so, they will damage a cable. Surely there is little difference between burying unprotected lighting and power services in walls and ceilings and unprotected heating cables in floors, and while there may be occasions where this is acceptable, in my view the number is relatively few.

The withdrawable system, which is initially a little more expensive, is not subject to the hazards I mention, and can be rewired easily, cheaply and without undue disturbance.

I would doubt if many electrical engineers would recommend the solidly embedded system if viewed entirely from the engineering point of view, and I believe that the consideration of cost would need to be very strong to change this view.

London, S.W.1. S. L. M. BARLOW.

Faraday House Policy

THE future training policy of Faraday House Engineering College was announced last week by the Board of Governors. The existing "Diploma of Faraday House" award, covering the broadest field of electrical engineering and leading to professional status, will continue, but two innovations will be made in 1959. An intermediate award of "Graduate of Faraday House" will be granted on successful completion of the academic part of the course (giving exemption from the I.E.E. graduate examination), the Diploma being given after a satisfactory practical training period. In addition an industry-based sandwich course for the Diploma award is being introduced, with a series of six-monthly periods of alternate practical and academic training. Because of industry's need for more trained men to support each chartered engineer, courses alternative to the Diploma course will also be introduced next year covering the fundamental principles with more concentrated study in one of the four broad zones of the field of electrical engineering, viz. power engineering, light engineering, telecommunications and electronics. These will lead to the new qualification "Associate of Faraday House."

With the new system students selected by an industrial concern for further tuition will enter the college at a level dependent on their existing educational qualifications. After one or two years' study a tripartite choice involving the employer, the college and the student will be made to select the student's future course to obtain either the Diploma or the Associate award.

Premiums for Technical Writing

ARTICLES on electronics published in 1958 which are eligible for premiums awarded annually by the Radio Industry Council will be considered by the panel of judges early in the New Year. Six premiums of 25 guineas each are offered to any writers not earning their living wholly or mainly by writing. The judges, headed by Prof. H. E. M. Barlow, Professor of Electrical Engineering, University College, London, are given the greatest possible freedom in deciding which articles merit awards, but they principally take into consideration the value of the article in making known British achievement in radio and electronics, originality of subject, technical interest, presentation and clarity. Articles should be submitted to the secretary of the Radio Industry Council, 59, Russell Square, London, W.C.1, before the end of the year. Six copies of the journal or relevant pages, proofs or reprints, with a signed declaration of the eligibility of the writer or writers, should be submitted.

International Exchange of Students

The 11th annual report of the International Association for the Exchange of Students for Technical Experience (I.A.E.S.T.) has just been published. During the year Great Britain received 829 foreign students and sent 774 students abroad.

PARLIAMENTARY REPORT

Coal, Oil and Nuclear Power

Is it wise to devote so much capital to the nuclear power programme when the stockpiles of coal are so big? The question was raised in the House of Lords last week by Lord Alexander of Hillsborough, leader of the Opposition Peers.

Replying for the Government, Lord Kilmuir, the Lord Chancellor, said the nuclear programme would provide 5 to 6 million kW of installed capacity by the end of 1966. By that time there would be an increased demand for energy equivalent to between 40 million and 48 million tons of coal. It was true that the capital cost of the nuclear programme would add some £750 million to the equivalent conventional programme as capital cost, but the fuel costs would be much lower. What they were doing gave a promise of energy cheaper than that produced by conventional means.

In the House of Commons Mr. Stan Awbery asked the Paymaster General what inquiries had been made into the possibility of replacing oil burning installations by those burning coal so that the surplus coal now available could be utilised and the heavy cost of imported oil saved.

Mr. Maudling said the Government's policy was that consumers should be free to make their own choice of fuels in the light of cost and efficiency for any particular job. They did not consider that the present temporary surplus of coal, judged in relation to the cost of imported oil, warranted any departure from this policy.

Replying to Mr. Palmer, who asked what modifications were being made in the nuclear power programme because of the falling capital cost of coal-fired power stations and the surplus of small coal, Mr. Maudling said it was still intended to complete between 5 and 6 million kW of nuclear capacity by the end of 1966. This meant there was no change of plan.

Cross-Channel Cable

Mr. Palmer asked the Paymaster General about progress to date of the scheme for the interconnection of the French and British electrical power systems.

Mr. Maudling said the converting plant had been ordered and was being manufactured; prototype valves were undergoing a test. Cable trials had been carried out by the Generating Board and Electricité de France and the results of the trials were being examined.

Public inquiries had been held on the proposed routes for the associated 275 kV transmission lines and the site for the converter substation at Lydd. Subject to the outcome of these inquiries it was hoped that trial runs prior to commissioning would be possible by the end of 1960. If these were satisfactory the line could be brought into use during 1961.

Mr. Palmer asked if the Minister would agree that this was a tremendous project—the responsibility of two nationally-owned industries—and would he draw the attention of the Federation of British Industries to that fact?

Mr. Maudling said he was well aware that this was an important project which would save a great deal of capital expenditure in this country.

Tropospheric Scatter Radio Stations

Asked about the dangers of radiation from the proposed tropospheric forward-scatter radio stations to be built in the U.K. for the N.A.T.O. defence system, Mr. Charles Orr-Ewing, Under-Secretary for Air, said the plans for constructing a small number of stations of this type were still being examined. They were for radio communication and not radar warning. The plans were being developed in full consultation with the appropriate N.A.T.O. authorities. Local interests would be consulted wherever this was required by the agreed planning procedure. The stations would be so designed and located that no radiation hazards would arise to the general public nor would any houses have to be evacuated.

Windscale Reactors

Mr. Mason asked the Prime Minister what consideration had been given to the problem of safely disposing of the Windscale atomic reactors, and to what extent the Government had considered a policy for the future dismantling of atomic power stations in the event of similar accidents, or as their useful life ended.

Mr. Macmillan said the A.E.A. had decided to seal the concrete vaults surrounding the cores in the Windscale reactors. Damage to some of the fuel elements in pile No. 1 prevented their removal, but the remainder would be removed and used again, as would all the fuel elements from pile No. 2. The sealed vaults would ensure against any exterior hazard. The reactor buildings would be used by the Authority for other purposes. It did not seem necessary to make any further plans at present.

Colour Television

Mr. Woodburn asked whether the B.B.C. was now free to develop colour television and what steps would be taken to get agreement on standards which would permit British manufacturers to have access to world markets.

Mr. Marples, Postmaster General, replied that the B.B.C. had completed a series of tests in colour and had reported to the Television Advisory Committee. This committee had not yet reported to him. There were many technical problems, and it would be a pity to embark on expensive colour equipment before these had been settled.

Houses for Power Station Workers

Mr. Henry Brooke, Minister of Housing and Local Government, was asked by Mr. Burke how many applications had been received under the Housing Subsidies Act, 1956, from local authorities who wished to build houses for key workers at new generating stations. He replied that 26 applications had been received and 23 granted.

Rural Development

Sir Archer Baldwin asked the Paymaster General whether he would reinstate the cut made in the amount of money allocated for the 1958-59 rural development programme.

Sir Ian Horobin, Parliamentary Secretary, Ministry of Power, said the Area Electricity Boards had made such good progress with rural electrification that they were now ahead of the long-term programme for bringing supplies to farms adopted in 1953. Nevertheless the needs of rural areas would be kept in mind in any review of investment in the electricity industry.

Questioned further, he said the possibility of even faster progress in the small number of farms and villages not yet connected was being considered. Already 90 per cent of premises other than farms had been electrified and the figure for farms was not far short of that.

PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £257 0s 0d
Fire Refined 99·70%	ton £256 0s 0d
Fire Refined 99·50%	ton £255 0s 0d
COPPER Tubes ..	lb 2s 5½d
Sheet	ton £289 0s 0d
H.C. wire and strip ..	ton £311 5s 0d
LEAD, English ..	ton £76 10s 0d
Foreign	ton £75 0s 0d
MERCURY	flask £78 0s 0d
TIN, block (English) ..	ton £763 10s 0d
ZINC, G.O.B. Foreign	ton £75 5s 0d
BRASS Tubes (solid drawn)	lb 2s 0d
Wire	lb 2s 9½d
PHOSPHOR BRONZE Wire	lb 4s 3½d
PLATINUM	oz £21 5s 0d
RUBBER, No. 1 R.S.S. spot	lb 26⅞d—26⅝d

PERSONAL AND SOCIAL

News of Men and Women of the Industry

Mr. F. N. Sutherland, C.B.E., M.A., M.I.E.E., for eleven years general manager of Marconi's Wireless Telegraph Co., Ltd., has been elected to the board and appointed managing director with effect from 5th November. He has also been elected a director of Marconi Instruments, Ltd.

Mr. F. N. Sutherland

Mr. Paul de Laszlo, O.B.E., who has been associated with the Marconi group of companies for a number of years, has been elected to the boards of Marconi's Wireless Telegraph Co., Ltd., and Marconi Instruments, Ltd., also with effect from 5th November.

Crompton Parkinson, Ltd., have announced changes in senior executive posts.

The increasing complexities of the company's affairs make it necessary that an executive director should be made free for special duties and **Mr. C. A. J. Martin,** G.C., M.C., B.A., A.M.I.E.E., is relinquishing his position as general sales manager, plant division, to become available in this capacity. He will remain an executive director of Crompton Parkinson, Ltd., and a member of the board of executive directors. Mr. Martin was educated at Trent College and Emmanuel College, Cambridge, where he took his degree in the mechanical science tripos. He has earlier held positions with the Metropolitan-Vickers Electrical Co., Ltd., and A.S.E.A. Electric, Ltd. He held a commission in the Royal Garrison Artillery in the 1914-18 war, being awarded the Military Cross in 1918. In the last war he was a major in the Royal Engineers, receiving the George Cross in 1943.

During nearly 30 years' service with Crompton Parkinson, Ltd., he was for many years sales manager for fractional horse-power motors, and for five years was chairman of the Fractional H.P. Motor Association. In 1951 he was appointed general sales manager of the plant division covering all the plant products of the Crompton Parkinson group. He was appointed an executive director of the company in 1954. Mr. Martin will shortly be leaving on a tour of East Africa.

As from 17th November, **Mr. K. Younger** will become general sales manager, plant division. He has served with the company for thirty-three years, and has been manager, London branch, plant division, since 1948. He served his apprenticeship at the company's Guiseley and Chelmsford Works, and after sales engineer appointments in Bristol, Birmingham and Leeds, became manager of the Leeds branch in 1941. From 1946 to 1948 Mr. Younger was product sales manager for rotating machines and the company's representative on the Dynamo & Motor Manufacturers' Association. He served as liaison between Crompton Parkinson and the Ministry of Supply from 1939 to 1941 on the construction of two small arms ammunition plants.

Mr. A. Morris, M.B.E., is appointed manager, London branch, plant division, in succession to Mr. Younger. Mr. Morris joined Crompton Parkinson as an apprentice in 1932 and subsequently became a member of the Switchgear Department at Chelmsford. During the last war he served as a major with the Royal Engineers in the Far and Middle East, and was made an M.B.E. In 1949 he rejoined Crompton Parkinson as a switchgear and transformer specialist at Bristol and then transferred to Cardiff where he was appointed branch manager in 1954.

Mr. C. E. Hucker, as already announced, has been appointed to succeed Mr. Morris as manager, Cardiff branch, plant division.

Mr. K. D. Dannenberg, Dipl.Ing., who, with **Mr. R. G. Terry** contributes an article this week on "High Voltage Lightning Arrestors" (page 928), is with E.M.P. Electric, Ltd., and is a director of E.M.P. Electric (Canada), Ltd., the Canadian subsidiary. He is well known for his work on lightning arrestor design and has been a frequent visitor to North America, where his firm has important e.h.v. arrestor installations, notably on the systems operated by the Bureau of Reclamation and the Bonneville Power Administration in the U.S.A.

Mr. R. G. Terry, A.M.I.E.E., is with Aberdare (Holdings), Ltd., and is a director of their Canadian subsidiary, Electric Switchgear (1953), Ltd., Montreal. Since 1955 he has also been directing the Canadian operations of E.M.P. Electric (Canada), Ltd. Both Canadian companies have extensive contracts in North America and are substantial dollar earners for Britain. Mr. Terry is shortly returning to the United Kingdom to take up a new appointment.

Mr. K. D. Dannenberg

Mr. R. G. Terry

Three new appointments are announced by Philips Electrical, Ltd., to take effect from 1st January next.

Mr. H. Thorne, at present general regional manager, south-east region, is to be a personal assistant to the managing director, responsible for market development, **Mr. W. F. Cassidy,** at present regional manager, Midlands region, becomes general regional manager, south-east region, and **Mr. D. E. Beard,** at present branch manager, Bristol, is appointed regional manager, Midlands region.

Mr. Thorne joined Philips in 1929 and the greater part of his career with the company has been spent on the radio side. He served with the R.A.O.C. at home and abroad through-

Mr. C. A. J. Martin

Mr. K. Younger

Mr. A. Morris

Mr. H. Thorne

Mr. W. F. Cassidy

Mr. D. E. Beard

Mr. S. Anderson (right) hands over the presidency of the Lightmongers to Mr. J. E. Lane at last week's annual dinner ("Electrical Review," 7th November, p. 863)

out the war, attaining the rank of major. In 1949 he was appointed sales manager of the TV and radio division, and in 1955 took over the south-east region. He is a member of the B.R.E.M.A. TV Promotion, and Commercial and Statistical Committees.

Mr. Cassidy joined the company before the war as a radio representative in Yorkshire. In 1950 he was appointed branch manager in Birmingham, and when the Midlands region was formed he was made regional manager. A member of the R.A.F.V.R., he served from 1939 to 1945, being demobilised with the rank of squadron leader.

Mr. Beard joined the Accounts Department in 1936. After war service with the Royal Signals in Europe and West Africa, he rejoined the company in 1946 and was appointed a lighting division sales engineer at Bristol. He was made branch manager in 1949. An active member of the Illuminating Engineering Society, he was chairman for 1954-55 and has been a Council member since 1955. He also served as chairman of the Association of Public Lighting Engineers, South Western Section, in 1956-58.

The following appointments have been made in the A.E.I. Turbine-Generator Division:—**Mr. J. Richmond** has been appointed divisional executive (Rugby) and sales manager (Rugby), succeeding **Mr. J. G. Boddy,** who relinquished these positions to take up another appointment in the group. **Mr. J. W. Ward** has been appointed assistant sales manager (Rugby). **Mr. D. R. S. Turner,** formerly manager (Larne Works), is now divisional commercial manager, taking over the duties previously performed in that capacity by **Mr. R. J. Cochran,** who is devoting full time to his position as divisional general manager. **Mr. R. R. Whyte,** hitherto divisional manufacturing manager (Trafford Park), has been appointed divisional manufacturing manager, retaining his existing appointment as assistant works manager (mechanical), Trafford Park. **Mr. W. T. H. Golding** is works manager (Larne Works). **Mr. R. O. Knight** is now superintendent, Larne Works. Earlier appointments not hitherto recorded include **Mr. H. I. Wood,** chief engineer, Turbo-Generator Department, Trafford Park; **Mr. F. R. Harris,** chief engineer, Gas Turbine Engineering Department; **Mr. F. W. Craven,** superintendent, Small Turbine Department; and **Mr. J. B. P. Wood,** assistant superintendent, Small Turbine Department. These departments form part of the A.E.I. Turbine-Generator Division.

Sir Richard Yeabsley, C.B.E., has been elected chairman of the Ruberoid Co., Ltd., in succession to the late Mr. Davis L. Irwin.

Mr. F. B. Bishop, chairman of Morphy-Richards, Ltd., in his annual review of the company's activities (abstracted in our last issue), stated that the company had recently set up its own sales company in Denmark. The new company is to be known as M-R Salgsorganisation A/S and its headquarters will be at Hultmannsvej 3, Hellerup, Copenhagen. **Mr. Finn Boeck** has been appointed general manager in charge of operations in Denmark. He had his own agency in Copenhagen representing various European firms in electrical and hardware fields until the new M-R company was set up in Denmark.

Mr. F. Boeck

The annual dinner of the Midlands Branch of the **Electrical Trades' Commercial Travellers' Association** was held at Edgbaston on 24th October and was well attended by members and representatives of most sections of the electrical industry in the area. Mr. W. S. Lewis, C.B.E., J.P. (chairman, Midlands Electricity Board), the president, proposed the toast to the Branch, congratulating it upon its progress and efforts for charity during the year. Mr. T. C. Browne, the Branch chairman, responded. Mr. P. M. King, vice-chairman, proposed the toast to the guests, Mr. H. Horrocks (joint managing director of Bulpitt & Sons, Ltd.) responding. The charity appeal, made in an original and witty way by Mr. J. Walker, resulted in a record collection.

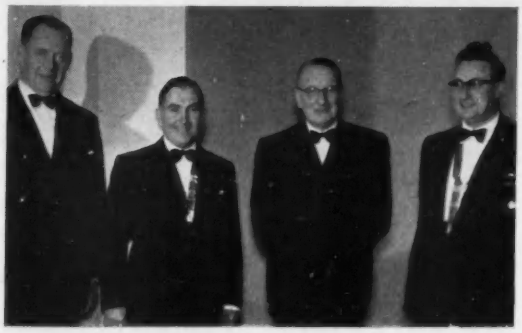
Mr. S. D. Gunn has been appointed sales manager of the appliance division of the Midland Electric Manufacturing Co., Ltd. Mr. Gunn joined the company in 1937 and became S.W. Midlands representative in 1946. His newly appointed staff include four lady representatives—**Miss J. E. Bagnall, Miss M. Hayward** (Midlands), **Mrs. J. Davis** and **Mrs. M. Pearson** (London).

Mr. S. D. Gunn

The Council of the British Institution of Radio Engineers announces that the president-elect for 1958-59 is **Professor E. E. Zepler,** who occupies the Chair of Electronics at the University of Southampton. His election will be confirmed by members at the Institution's annual general meeting on 26th November when he will give his presidential address.

Mr. J. K. Edwards, M.A., A.M.I.E.E., whose article, "Electronics in the Steelworks," is published in this issue (page 897), was educated at Queens' College, Cambridge. Wartime regulations permitted him to take his mechanical science tripos in his second year, after being awarded a college exhibition at the end of his first year. From 1943 to 1947 he served in the R.A.F., lecturing on airborne radar in India and Ceylon where he spent a time as senior radar officer at air headquarters. After his demobilisation in 1947 he joined Richard Thomas & Baldwins' Service and Advisory

Mr. J. K. Edwards



E.T.C.T.A. Midlands Branch annual dinner. Left to right: Messrs. H. Horrocks (joint managing director, Bulpitt & Sons), T. C. Browne (chairman, E.T.C.T.A. Midlands Branch), W. S. Lewis (president) and F. A. Bartlam (national chairman)

Division, and in 1950 he was appointed assistant electrical development engineer at Richard Thomas & Baldwins' Ebbw Vale Works. In 1956 he joined the Steel Company of Wales, Abbey Works, as an assistant project engineer, and is now principally concerned with cold mill development work.

Mr. B. F. Levett, a director of Powers-Samas Accounting Machines, Ltd., has been elected president of the Office Appliance and Business Equipment Trades Association.

To mark the retirement of the works general manager, **Mr. J. Herd,** Claude-General Neon Lights, Ltd., gave a party at Wembley recently at which Mr. S. D. Moyse, managing director, presided. Gifts of a refrigerator from employees and a set of chairs from the directors were presented to Mr. Herd.

Mr. Herd joined the Coventry Tele-

Mr. S. D. Moyse (right), managing director, greets Mr. J. Herd, works general manager, at the party given by Claude-General Neon Lights, Ltd., to mark Mr. Herd's retirement

phone Works of the G.E.C. in 1923. He moved to Claude-General at Wembley in 1934 as works accountant and five years later was appointed works general manager.

Mr. R. H. Gill (chairman) presided at the annual dinner-dance of the Leicester Branch of the **Electrical Contractors' Association** held on 7th November at the Grand Hotel, Leicester. Increasing competition was welcomed by Mr. C. F. Parkinson, chairman of the Midland Section Board, who said that this would help contractors to push ahead and improve their service to the public and he also spoke of the good relations between contractors and their local Electricity Boards. Ald. S. Brown (Lord Mayor of Leicester), who proposed the toast of the Association, said he wanted to see uniform fittings and a uniform supply voltage throughout Europe and he spoke of difficulties he had experienced with appliances while travelling on the Continent.

At the I.E.E. Tees-Side Sub-Centre annual dinner held last Friday at Saltburn. Left to right: Mr. S. E. Goodall (president), Mr. E. Bates (chief commercial officer, N.E.E.B.), Mr. L. F. Robson (Sub-Centre chairman), and Mr. N. C. Lake (deputy manager, Head, Wrightson & Co., Ltd.)

Mr. J. S. Beddows has been appointed manager of the Nottingham branch of the General Electric Co., Ltd., in succession to **Mr. T. H. Greaves,** who is retiring next year after being manager since 1920. Mr. Beddows, who took up his new appointment on 1st November, was formerly manager of the company's Stoke-on-Trent branch. **Mr. N. J. Howitt,** who was previously manager of the Installation Materials Department at Nottingham, has been appointed manager of the Stoke branch.

The Secretary of State for War, Mr. Christopher Soames, recently visited the works of the **Igranic Electric Co., Ltd.,** at Bedford to present awards to 40 apprentices. Mr. Soames, who is M.P. for Bedford, told the audience of 700 parents and officials of the company: "We have to keep ahead in the technical race. New products, new ideas must be our responsibilities." To-day our exports were booming, he said, and 20 per cent of them consisted of goods that were not exported ten years ago.

Mr. Christopher Soames presenting an award to an Igranic Electric Co. apprentice, Mr. J. W. Pearce

One industry vitally concerned in this was the electrical industry. Despite the march of automation the need for skill was greater than ever.

Mr. John Smith, J.P., A.M.C.T., M.I.Mech.E., A.M.I.Mar.E., has been appointed technical director of Petters, Ltd. He was previously technical director of the National Gas & Oil Engine Co., Ltd., which he joined in 1928.

Mr. Basil de Ferranti, a director of Ferranti, Ltd., was elected Conservative Member of Parliament for Morecambe and Lonsdale at a by-election on 5th November with a majority of 11,231 over his Labour opponent.

Mr. B. de Ferranti

Recent engineering and commercial appointments announced by the Metropolitan-Vickers Electrical Co., Ltd., include those of **Mr. C. F. Saunders,** Assoc.M.C.T., A.M.I.E.E., M.Inst.W., formerly chief engineer, Heating and Welding Department, as chief engineer, Standards Department; **Mr. G. H. Moule,** formerly assistant chief engineer (heating), Heating and Welding Department, as chief engineer, Heating and Welding Department; **Mr. R. F. Mansfield,** A.M.I.E.E., as assistant sales manager, Industrial Control Department; and **Mr. F. Crowther,** Assoc.M.C.T., A.M.I.E.E., as assistant chief engineer (design), Industrial Control Department.

As part of the policy of integration between Mirrlees, Bickerton & Day, Ltd., and the National Gas & Oil Engine Co., Ltd., due to the impending resignation of **Mr. B. R. Cant** as director and general manager of the National Gas & Oil Engine Co., Ltd., three appointments are announced.

Mr. R. L. Watt has been appointed a director of the National Gas & Oil Engine Co. and, whilst remaining director and general manager of Mirrlees, Bickerton & Day, will be seconded to the National Gas & Oil

The Rugby Sub-Centre of the I.E.E. held its annual dinner at Rugby on Thursday last week. In the picture are (left to right) Sir Archibald Gill (past-president, I.E.E.), Judge Hamilton and Mr. E. M. Price (general manager, English Electric Rugby and Whetstone Works)

Engine Co. at Ashton-under-Lyne, as general manager from 1st December.

Mr. D. Adamson, works and planning manager of Mirrlees, Bickerton & Day, has been appointed a director of the National Gas & Oil Engine Co. and a local director of Mirrlees, Bickerton & Day. He will be seconded to the National Gas & Oil Engine Co. as works director, with effect from 1st December.

Mr. F. Wood, at present general works manager of the National Gas & Oil Engine Co., relinquishes this position with effect from 1st December, and is being seconded from that date to Mirrlees, Bickerton & Day as works manager.

Mr. J. T. Grundy, chief lighting sales engineer of Siemens Edison Swan, Ltd., left London yesterday (Thursday) for a tour of the Middle East and North and South Rhodesia in connection with various lighting schemes being carried out by the company. Mr. Grundy expects to return home on 19th December.

Mr. R. P. Sayers, Associate I.E.E., F.I.E.S., M.S.M.A., has been appointed managing director of Griersons, Ltd. Before joining Griersons Mr. Sayers was a director and sales manager of Ashley Accessories, Ltd., and a director of Astral Switchgear, Ltd.

Mr. R. P. Sayers

On 7th November over 400 engineering apprentices of the **English Electric Co.'s** Stafford works received awards and indentures from Group Captain D. R. S. Bader, C.B.E., D.S.O., D.F.C. The presentations were made before an audience of apprentices, their parents and friends, in the Borough Hall, Stafford, under the chairmanship of Mr. B. J. Tams, chief of personnel and education. In addition to indentures for those apprentices successfully completing their training, awards were made in the craft and technician grades for progress in the works and achievement at the Technical College. In introducing Group Captain Bader, Mr. J. R. Sully, general manager of the Stafford works, expressed general satisfaction with the application shown by the apprentices both in the workshop and in their studies. He also referred to substantial sums of money the company was spending on education. The report of the year's work was presented by Mr. E. G. Carwardine, education superintendent at the Stafford works, and a vote of thanks was proposed, on behalf of the apprentices, by Mr. W. D. C. Turner. The evening concluded with dancing.

Ransomes Sims & Jefferies, Ltd., have appointed **Mr. C. P. Seager** as industrial truck sales manager. He will be assisted by **Mr. J. E. Ovell,** who has been appointed assistant truck sales manager.

In view of the fact that it will be many weeks before he is fully recovered and that it will then be necessary for him to have another operation, **Mr. F. Westerman** has decided to retire from the chairmanship of F. Westerman (Wholesale), Ltd., and from active participation in the management of the company. He will, however, remain on the board in a consultative capacity. **Mr. H. E. Bagnall** will in future be responsible for the management of the company.

The Birmingham Centre of the **Illuminating Engineering Society** held its annual ladies' night on 6th November at the Botanical Gardens Ballroom, Edgbaston, Birmingham. The guests were received by Mr. L. E. Gibbs (chairman of the Centre) and Mrs. Gibbs and Mr. C. C. Smith, M.I.E.E. (president) and Mrs. Smith. The toast to the ladies was proposed by the chairman, to which Mrs. Smith responded.

Left to right: Mr. L. E. Gibbs, Mrs. L. E. Gibbs, Mrs. C. C. Smith and Mr. C. C. Smith at the annual ladies' night of the Birmingham Centre of the I.E.S.

Mr. M. H. Sayers, D.S.C., A.M.I.Mech.E., has been appointed apprentice training manager of F. Perkins, Ltd. He succeeds **Mr. J. Talbot,** who is taking up an appointment outside the company.

Mr. P. J. Morris, senior assistant commercial engineer of the Essex Sub-Area of the Eastern Electricity Board, has retired and his colleagues recently presented him with two hide travelling cases, a film projector, a travel log and album containing the names of the subscribers. The presentation was made by the sub-area commercial officer, Mr. W. E. Wardrop.

Mr. Morris was formerly with the County of London Electric Supply Co. as manager of its Woodford District and was appointed senior assistant engineer in the Commercial Department of the Essex Sub-Area at vesting date.

Mr. W. E. Wardrop (left) making a presentation to Mr. P. J. Morris

The South Western Electricity Board has announced three new appointments. **Mr. W. F. Smith,** A.M.I.E.E., at present deputy group engineer (Devon), is appointed group engineer of the Board's Somerset group of Districts. **Mr. D. Hustwick,** deputy establishments officer, becomes group administrative officer (Somerset) and **Mr. J. H. Phillips,** Associate I.E.E.,

Mr. W. F. Smith

Mr. D. Hustwick

Mr. J. H. Phillips

at present senior assistant engineer (commercial) of the Cornwall Group, is appointed group commercial officer (Cornwall).

Mr. Smith has been in the electrical industry for thirty-five years. From 1928 to 1948 he was with the Plymouth Corporation Electricity Department, latterly as chief technical assistant, and in the last mentioned year was appointed distribution engineer (Plymouth) with the South Western Board, being promoted district engineer in 1950 and becoming deputy group engineer (Devon) in 1954.

Mr. Hustwick received his early training with the Leeds Corporation Electricity Department. From 1942 to 1947 he was on active service and served with the Royal Army Ordnance Corps in Egypt. He joined the Yorkshire Electricity Board in 1949 and was principal assistant (establishments) from 1950 to 1956. Mr. Hustwick has been the S.W. Electricity Board's deputy establishments officer since 1956.

Mr. Phillips received his early technical training with the Cornwall Electric Power Co., with which he became branch manager, St. Ives, and later branch manager at Penryn. In 1948 he was appointed the Board's regional maintenance engineer in Cornwall, becoming District commercial engineer in 1950 and senior assistant engineer of the Cornwall group of Districts in 1954.

The Chief Constable of Bristol last week presented a life-saving award to **Mr. E. F. Denbury,** editor of the South Western Electricity Board's house journal *South Western Electricity,* who rescued two-year-old twins from a house on fire in Clifton. The award is a certificate of the Society for the Protection of Life from Fire, and the citation commends Mr. Denbury's "distinguished conduct while engaged in the rescue of life in a fire."

The annual dinner of the **Faraday House Old Students' Association** was held at the Savoy Hotel, London, on 6th November. Sir Hamish MacLaren, a vice-president of the Institution of Electrical Engineers, proposed a toast to the College, referring to the new governing board and its plans for the College to make a greater contribution to meet the increasing need for engineers (see page 908).

Colonel B. H. Leeson, chairman of the College Governing Board, replied. After paying a tribute to Mr. J. O. Ince, the last chairman, he said that the College had always looked ahead to anticipate the demands of industry. He then outlined the College's future policy which has been introduced to conform to the changing trends of a growing profession and spoke of its unique position as a free educational enterprise.

Mr. T. A. D. Honnor, president of the Faraday House Old Students' Association, gave some details of earlier dinners when proposing the toast "The Guests," the reply to which was made by Sir Alexander Fleck, chairman of Imperial Chemical Industries, Ltd.

The Sussex Centre of the **Electrical Industries Benevolent Association** is holding its annual ball at the Grand Hotel, Brighton, on Friday, 30th January. Tickets (32s 6d each) can be obtained from the honorary secretary, Mr. T. H. Batchelor, 10, Queen's Gardens, Hove, 3, Sussex (telephone: Hove 39211).

The Royal Society has awarded the Hughes Medal to **Professor E. N. da C. Andrade,** F.R.S., Emeritus Professor of Physics in the University of London, for his distinguished contributions to many branches of classical physics.

At last Tuesday's luncheon of the **Electrical Industries Club** the guest speaker was Mr. C. T. Melling, C.B.E., a member of the Electricity Council. Mr. Melling said that although the electricity supply industry's load factor (about 48 per cent) was considered to be low it was better than that of most other industries or services. Much had been done by way of incentive tariffs, diversity of use, the devising of new uses and the rearrangement of machines and processes to improve load factor. It was what happened on the consumer's side of the switch that determined load factor and it was the task of the supply industry, the manufacturers and the contractors to do their part in improving it.

A vote of thanks to the speaker was proposed by Mr. P. G. Wallis, National Inspection Council. In the chair was Sir John Hacking (president) who was earlier invested with the new presidential badge by Mr. A. F. Plummer. The speaker at the next luncheon (9th December) will be Mr. J. E. S. Simon, Q.C.

OBITUARY

Mr. J. Smith.—The death occurred on 1st November, at the age of sixty-five, of Mr. John Smith, manager of the northern area branches of the Sun Electrical Co., Ltd. Mr. Smith joined the company in 1923 as assistant manager of the Leeds branch, became manager of the Newcastle branch in 1945 and in 1950 returned to Leeds as manager, an appointment which was later combined with that of northern area manager. Mr. Smith was an active member of the Leeds Electrical Club.

Mr. P. G. Pettifor.—The death is announced, on 3rd November, of Mr. Percy Godfrey Pettifor, A.M.I.E.E., who for over thirty years was assistant manager of the apparatus shops of Siemens Bros. & Co., Ltd., Woolwich. He retired in 1942.

Mr. W. Yuille.—The death has occurred of Mr. William Yuille, formerly manager of the Glasgow and Edinburgh branches of Foster Electrical Supplies, Ltd. Mr. Yuille, who was eighty, joined the company in 1924 and retired in 1950.

Mr. C. W. Cosgrove, B.Sc.(Eng.), M.I.E.E., M.I.M.W., formerly general manager of the Osram lamp and glass factories of the General Electric Co., Ltd., died on 3rd November at the age of sixty. Mr. Cosgrove joined the Marconi-Osram Valve Co., Ltd., Hammersmith, in 1922, as a technical assistant and was appointed factory superintendent in 1929. He became assistant works manager in 1941 and works manager in 1950. A year later he was appointed assistant general manager of the Osram lamp and glass factories, of which he became general manager in 1953. Mr. Cosgrove was also chairman of Glass Bulbs, Ltd., and a director of other associated companies of the G.E.C.

The late Mr. C. W. Cosgrove

Mr. F. G. Russell.—The death is reported, on 1st November, of Mr. Frederick George Russell, A.M.I.E.E., former general manager of the Tata Hydro-Electric Co., of Bombay.

Chapel Cross Reactor Critical

The United Kingdom Atomic Energy Authority announced on Monday that the first of the four reactors at the Chapel Cross nuclear power station near Annan, Dumfriesshire, became "critical" on Sunday evening and was now operating at low power and undergoing tests. It should start to supply electricity to the grid at the beginning of next year. Like Calder Hall, Chapel Cross has the dual purpose of producing plutonium for military purposes and supplying electricity to the grid. All four reactors should be in operation by the end of 1959. They are of the graphite-moderated, gas-cooled type using natural uranium as fuel and each has a designed capacity of about 50 MW.

NEW A.E.I. HEADQUARTERS

Comprehensive Electrical Services

WE have already reported that the London establishments of the companies comprising the Associated Electrical Industries, Ltd., group have moved into the large new building known as 33, Grosvenor Place, London, S.W.1, facing the gardens of Buckingham Palace. Last week we had an opportunity of inspecting the new premises and found the arrangements most impressive. While the building itself, to conform with its neighbours, is "conventional," the interior arrangements reflect the variety of taste of the occupants.

It goes without saying that the electrical equipment of the building is comprehensive and up-to-date. A great deal of attention has been paid to "atmosphere" and the comfort of the people who work there. An outstanding feature is the thermal storage plant which provides hot water for the air conditioning of the building and for the kitchens and other services. Much of this is off-peak load and altogether there is 810 kW of capacity. Floor warming has been extensively used and the total loading of this is 1,210 kW.

About 1,000 people can be catered for by the well-equipped main kitchen which serves the main dining room, seating 250-300 people at a time, and a senior staff mess-room. The equipment supplied by Benham & Sons, Ltd., includes a four-unit heavy duty electric range with bain marie, two salamander grills, a pastry oven, deep-fat frying range, a boiling table, boiling pans and hot closets. There is a 75ft long service counter and a "Hercules" conveyor type dishwasher and calorifier and tea and coffee making equipment. The total kitchen load is 410 kW. There is also a separate directors' kitchen on the fifth floor.

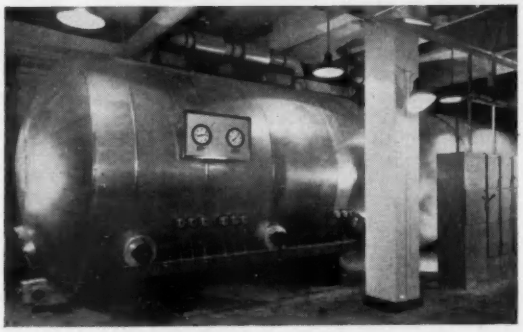
There is a full lift service for which Metropolitan-Vickers and the British Thomson-Houston Co. have provided drives and a control system which ensures smooth and accurate operation.

A private automatic branch exchange has 1,200 extensions and 160 exchange lines, including private lines to the group's constituent companies, e.g. Trafford Park and Rugby. It inter-operates with a fire-alarm system. This equipment was made by Siemens Edison Swan, Ltd., who also provided two emergency lighting equipments.

With the A.E.I. Lamp & Lighting Co., Ltd., as a member of the group the lighting system throughout the building is naturally adequate, efficient and attractive. Over 1,200 fluorescent and 700 tungsten lighting fittings have been installed.

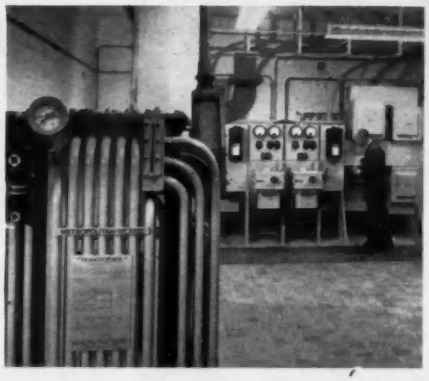
The total electrical load in the building is 3,580 kW. The switchgear in each of the two main substations includes two 400 A, 150 MVA, 6·6 kV class QF metal-clad ring main units controlling 1,000 kVA transformers supplied by the British Thomson-Houston Co. who also provided 55 motors totalling about 225 h.p. for various services and lift motors and motor-generator sets. Also in each of the substations is a three-panel 6·6 kV, 150 MVA Ferguson Pailin metalclad switchboard which consists of an IBM2 incoming oil switch and two Type

One of the 8,000 gallon water storage vessels in the main plant room. It has three B.T.H. 54 kW three-phase immersion heaters and a Sunvic thermocouple recording system



A view of the 410 kW kitchen showing some of the Benham electric cooking equipment

A.E.I. lighting fittings recessed into the false undulating ceiling of the cafeteria



Left : The Siemens Edison Swan telephone exchange (1,200 extensions and 160 exchange lines). Right : Metrovick 6·6 kV transformer in one of the two main switchgear rooms which contains Ferguson Pailin and Metrovick panels for the floor heating and water heating installations

V.S.B.P. solenoid-operated automatic oil circuit-breakers controlling the h.v. side of the thermal storage installation. On the l.v. side are two Type K4 800 A, 415 V, 25 MVA industrial oil circuit-breakers.

The architects of the building were Messrs. Wimperis Simpson & Fyffe; the main contractors Holland & Hannen and Cubitts, Ltd.; and the consulting engineers Messrs. Stinton Jones & Partners.

CABLE MANUFACTURE

A NEW cable shop, which is producing thermoplastic cables of many types, has recently been completed by Derby Cables, Ltd., a member firm of the Crompton Parkinson Group. The newly erected building is 255ft long and 80ft wide. At one end of the shop is a mezzanine floor on which is housed plant and apparatus for the storage and preparation of various thermoplastic materials.

The polymer of polyvinyl chloride (in powder form) is taken in bags from the ground floor by a sack elevator and stored on the mezzanine floor; plasticisers used in the preparation of p.v.c. compound are pumped from road tankers to large storage vessels above the mezzanine floor and later drawn from these tanks in automatically pre-set and measured quantities. Known quantities of polymer are then intimately mixed with the plasticisers, which results in a material having the consistency of wet sand.

Derby Cables thermoplastic cable shop from the mezzanine floor

This intermediate stage material is fed into a form of extruding machine known as a plastificator, where it is heated, milled and finally extruded through numerous orifices before being cut into small pieces. This process is known as gelling and cubing. The gelled cubes fall from the plastificator on to a shaker conveyor with a gauze bottom through which cold air is blown to prevent the small granules from agglomerating.

From the shaker conveyor, the granules are transferred by a simple belt conveyor to two chain conveyors, which traverse practically the whole width of the mezzanine floor. The chain conveyors have perpendicular outlet points above the extruding machines, through which the granules fall, through tubes, into the hoppers of the extruding machines proper on the ground floor. When the feed pipes to the extruding machines are full, the excess p.v.c. is automatically returned and stored in large silos which act as reserve stocks; one set of silos holds insulating grade p.v.c. and the other sheathing grade p.v.c.

On the ground floor are installed six extruding machines with thermostatically-controlled zoned electric heating and forced draught and other means of cooling. All the extruding machines except the largest, have capstan type haul-off equipment, whereas the largest machine embodies two tractor type hauling units, one feeding the cable into the extruding machine and the other taking the cable from the extruder and through a water cooling trough. The smaller machines are equipped with dual take-up equipment, which provides continuous running. Another ancillary to the small machines, which manufacture the core, is spark testing equipment, which enables a continuous preliminary check to be made on the product.

After testing and inspection, the cable passes on to the coiling or reeling machines. The desired lengths are pre-set on the measuring units, and the machines cut out at the predetermined length. The final operation is a further check for continuity, and then the cable is labelled and packed ready for dispatch.

S.I.M.A. CONVENTION

Opening of the S.I.M.A. Convention at the Majestic Hotel, Harrogate, last week, showing, left to right: Mr. W. H. Storey (hon. secretary, S.I.M.A.), Mr. R. Goudime (vice-president), Councillor C. Atkinson (Deputy Mayor), Mr. R. Barrington Brock (president), Mr. L. A. Woodhead (president-elect) and Mr. P. J. Ellis (treasurer)

THE 7th annual convention of the Scientific Instrument Manufacturers' Association (S.I.M.A.) was held at the Hotel Majestic, Harrogate, from 6th to 9th November. The main purpose of this convention was to provide an opportunity for instrument manufacturers and the users of instruments to meet and discuss their problems.

Four convention panels were arranged which respectively represented the iron and steel, textile and fibre, oil and chemical, and fuel and power industries. Each panel was divided into four sessions at each of which one particular aspect of instrumentation was discussed. For instance, the fuel and power panel, under the chairmanship of Mr. G. M. Sisson (Sir Howard Grubb Parsons & Co., Ltd.), devoted its first session to future trends and automation with Mr. A. E. Bennett (National Coal Board) as the principal speaker.

The second session was concerned with construction manuals, installation and servicing and Mr. E. G. Kingham (Central Electricity Research Laboratories) opened the proceedings by explaining his particular difficulties in this connection. At the third session Mr. B. H. Stonehouse (General Electric Co., Ltd.) discussed plant instrumentation with particular reference to nuclear power stations. In the final session Dr. J. W. Drinkwater (Shell Research, Ltd.) introduced the subject of laboratory instrumentation. The other three panels followed the same general pattern and the same subjects were discussed, but in a different order, so that, for instance, a man interested only in laboratory instrumentation could attend four sessions on this subject.

At all the meetings there were lively discussions mainly because the principal speakers did not deliver formal papers or lectures, but outlined their own difficulties in connection with the use of instruments. For the first time the S.I.M.A. convention provided a forum at which the big users of instrumentation equipment could meet the manufacturers in force and discuss current trends and future needs. The whole tone of the convention was such that it left no doubt that close co-operation between user and maker will promote wider use of essential instrumentation vital to progress in productivity, exports and standards.

Cordless Telephone Switchboard

LAST week the country's first cordless switchboard to receive Post Office sanction went into operation. It controls a private automatic branch exchange, manufactured by the Automatic Telephone & Electric Co., Ltd., and is installed at the European headquarters of the Canadian Pacific Railway Company in Trafalgar Square, London. In place of the usual jacks, plugs and cords there are neat rows of push-buttons and keys, mounted on a small desk, smartly styled in light oak with grey panelling. Even the familiar dial is there only for stand-by use, because "dialling" has been replaced by the much faster system known as "key-sending," which the operator uses for calling both internal and external numbers.

The exchange has 110 extensions, 29 lines to the public exchange and four private wires to other Canadian Pacific offices. Any extension can dial any other extension and can also dial outside numbers direct, from the same telephone. Direct access to an outside line can be barred to certain extensions if desired.

The two operators (as against four for the original equipment) are almost entirely occupied with incoming calls. A system of lamps indicates how many calls are waiting and these are automatically brought up in rotation. The operator sets up the number of the required extension by pressing the appropriate push-buttons and then presses the "send" key; if the line is free the outside call is put through automatically. If the line is busy a "ring when free" facility can be used. This device rings the extension when it becomes free and automatically connects the outside call. A speaker at an extension can "hold" an outside call while an internal call is being made and can transfer an outside call to another extension without help from the operator.

Cordless telephone switchboard at the London headquarters of the Canadian Pacific Railway Co.

United States Electrical Trade in 1957

CONTINUED EXPANSION OF IMPORTS AND EXPORTS

DESPITE the recession, the foreign electrical trade of the United States showed an encouraging upward trend in 1957. During the year the value of electrical imports rose by 18 per cent to £51·8 million and electrical exports rose by 5 per cent to £365·2 million. The value of electrical exports during the two preceding years was £347 million and £302 million respectively. The prominence of Canada as the principal market for United States electrical goods is clearly seen from Table 1. Next in importance are the Latin American countries, and in Europe the United Kingdom, Spain, Italy and France are the largest markets. United States exports to the United Kingdom of £7·7 million in 1957 were an increase of 9 per cent over the previous year.

Table 3 shows that outstanding among the individual items of equipment exported were household refrigerators (£17·2 million), diesel powered generating sets (£12·6 million), telephone equipment (£11·6 million) and electrical equipment for vehicles and engines (£10·9 million). Table 2 shows that Western Germany (£14·5 million) was the largest single supplier of electrical goods to the United States in 1957 and the United Kingdom came next with £12·6 million. The latter figure compares with imports from the United Kingdom of £5·3 million in 1955 and £9·2 million in 1956. The principal items imported (Table 4) were transformers, motors and radio and telephone apparatus.

The figures in Tables 3 and 4 represent about 95 per cent of the total trade in electrical goods. They cover principal products and countries only and are based on all exports individually valued at $500 and over and imports at $250.

TABLE 1.—UNITED STATES ELECTRICAL EXPORTS PRINCIPAL MARKETS

Country	Value (£000)	Country	Value (£000)
United Kingdom	7,725	West Germany	2,822
Canada	88,320	Switzerland	2,573
Mexico	19,100	Spain	5,132
Guatemala	1,452	Italy	6,422
El Salvador	1,232	Turkey	2,188
Honduras	735	Lebanon	1,202
Nicaragua	799	Iraq	1,199
Costa Rica	901	Iran	2,182
Panama	1,172	Israel	935
Cuba	18,113	Kuwait	860
Jamaica	889	Saudi Arabia	1,988
Dominican Republic	2,020	India	5,452
Colombia	5,031	Pakistan	1,372
Venezuela	23,111	Thailand	1,610
Ecuador	977	Vietnam, Laos and Cambodia	1,666
Peru	4,351	Indonesia	2,192
Chile	4,152	Philippines	7,352
Brazil	7,934	Korea	7,349
Uruguay	823	Taiwan	2,623
Argentina	5,993	Japan	4,614
Sweden	3,142	Australia	4,114
Norway	1,303	Morocco	741
Holland	2,212	Belgian Congo	1,252
Belgium-Luxembourg	3,523	South Africa	4,252
France	4,721		

TABLE 2.—UNITED STATES ELECTRICAL IMPORTS PRINCIPAL SUPPLIERS

Country	Value (£000)	Country	Value (£000)
United Kingdom	12,612	France	1,292
Canada	6,322	West Germany	14,523
Sweden	1,422	Austria	464
Denmark	399	Switzerland	2,143
Holland	3,140	Italy	1,736
Belgium-Luxembourg	1,011	Hong Kong	721
		Japan	5,583

TABLE 3.—UNITED STATES ELECTRICAL EXPORTS PRINCIPAL PRODUCTS

Product	Value (£000)	Product	Value (£000)
Generators, d.c.	811	Arc welders, a.c.	610
Canada	525	Resistance welding sets	835
Generators, a.c.	1,440	Generator sets, diesel	12,600
Canada	527	*Canada*	1,180
Iran	140	*Mexico*	1,200
Japan	127	*Cuba*	1,825
Generator sets, steam turbine, 500 to 7,500 kW	2,070	*Venezuela*	780
Mexico	500	*Brazil*	555
Jamaica	268	*Argentina*	1,208
Cuba	217	*Sweden*	690
Canada	120	*Saudi Arabia*	410
Ditto, over 7,500 kW	4,330	*Australia*	615
Mexico	728	Generator sets, self-contained, excluding diesel, over 314 kW	2,550
Spain	3,060	*Canada*	360
Korea	281	*Venezuela*	233
Kuwait	150	*Korea*	181
Colombia	121	*Taiwan*	114
Arc welders, d.c.	3,070	Batteries, storage, lead acid	1,400
Canada	485	Ditto, n.e.c.-cell	825
Mexico	230		
Venezuela	505		
Brazil	152		

TABLE 3.—(continued)

Product	Value (£000)	Product	Value (£000)
Batteries, flashlight, cell	1,680	Motors, ¼ to 1 h.p.	590
Batteries, dry, multiple-cell	1,345	*Canada*	171
Capacitors, power	375	Ditto, 1 to 200 h.p.	5,050
Transformers, power, not over 500 kVA	3,000	*Canada*	1,180
Cuba	640	*Mexico*	530
Venezuela	740	*Venezuela*	390
Philippines	287	*Chile*	243
Ditto, over 500 kVA	2,850	*India*	426
Mexico	148	*Philippines*	203
Cuba	680	Ditto, above 200 h.p.	2,700
Venezuela	505	*Canada*	160
Brazil	356	*Mexico*	274
India	345	*India*	485
Transformers, instrument	832	*Japan*	366
Fluorescent ballasts	1,300	Electric propulsion motors for land vehicles	8,000
Regulators	575	*Canada*	4,840
Transformers, speciality	1,025	*Mexico*	279
Transformer and regulator parts	780	*Brazil*	490
Rotatory convertors up to 150 kW	1,170	*Australia*	326
Canada	246	*Belgian Congo*	187
India	161	Motor controls, industrial	4,560
Ditto, above 150 kW	1,025	*Canada*	1,350
Chile	212	*Mexico*	460
India	405	*Venezuela*	264
Rectifiers, non-rotatory	1,760	*Belgium*	280
Canada	820	*France*	119
Japan	128	*India*	133
Primary switchboards, panels and parts	7,040	Motor parts	2,900
Canada	341	*Canada*	1,180
Mexico	217	*Mexico*	200
Cuba	750	*Chile*	140
Venezuela	1,190	Portable tools, metal working	2,225
Brazil	298	*Canada*	1,045
Spain	340	*Venezuela*	604
India	740	Ditto, n.e.s.	1,628
Japan	440	*Canada*	860
Secondary switchboards, panels and parts	550	Ditto, parts n.e.s.	1,100
Circuit-breakers, oil, and parts	890	*Canada*	660
Ditto, others	8,800	Household refrigerators	17,240
Canada	2,090	*Canada*	4,125
Mexico	645	*Cuba*	1,885
Cuba	369	*Venezuela*	2,580
Venezuela	605	*Peru*	560
Brazil	420	*Belgium*	405
South Africa	254	*Lebanon*	634
Fuses and fuse plugs	603	*Iraq*	408
Lightning arrestors and chokes	665	Freezers	3,500
Watthour meters	570	*Canada*	2,400
Indicating instruments, non-recording	1,040	*Sweden*	194
Canada	294	Household refrigeration units	580
Recording instruments	468	Refrigeration and freezer parts	4,110
Testing instruments	7,380	*Canada*	1,860
Canada	1,590	*Mexico*	316
France	708	*France*	276
Italy	382	*Philippines*	182
Japan	410	*South Africa*	255
West Germany	336	Flashlights	710
Australia	306	Fans	1,560
Measuring and indicating instruments	1,360	*Canada*	262
Canada	468	*Mexico*	136
France	184	*Cuba*	163
Motors, under ¼ h.p.	1,619	*Venezuela*	277
Canada	545	Bulbs, lamps, small filament miniature small base	2,400
Mexico	132	*Cuba*	615
		Brazil	202
		Ditto, large base and filament	1,910
		Canada	700

TABLE 3.—(continued)

Product	Value (£000)	Product	Value (£000)
Bulbs, large base—*continued*		Electronic resistors ...	1,278
Cuba	170	*Canada*	287
Venezuela	201	Electronic inductors, transformers and coils ...	1,765
Switzerland	405	*Canada*	350
Fluorescent lamps ...	1,590	*Argentina*	266
Household washing machines, non-automatic	1,080	*Italy*	191
Canada	220	Electronic loudspeakers ...	654
Cuba	456	Electronic components n.e.s.	7,040
Venezuela	360	*United Kingdom*	77
Peru	419	*Canada*	2,270
Holland	190	*Mexico*	720
Ditto, semi- or fully-automatic	3,240	*Argentina*	760
Canada	1,480	*Italy*	272
Guatemala	362	*Australia*	303
Peru	362	Electronic accessories for electronic equipment ...	2,820
Venezuela	525	*Canada*	1,086
Ditto, parts	1,800	*Mexico*	175
Canada	870	Carrier current equipment and parts	1,140
Mexico	435	*Canada*	181
South Africa	142	*Mexico*	556
Electric laundry equipment and parts	964	Telegraph apparatus and parts	4,380
Household vacuum cleaners	1,289	*Canada*	2,145
Canada	1,120	*Cuba*	195
Ditto, parts	370	*Venezuela*	305
Household dishwashers ...	519	*Australia*	370
Canada	270	Telephone instruments ...	740
Mixers, juicers and blenders	1,260	Telephone equipment and parts	11,600
Canada	482	*United Kingdom*	835
Other motor-driven household appliances & parts	2,970	*Canada*	4,000
United Kingdom	136	*Cuba*	815
Canada	1,430	*Turkey*	432
Mexico	131	*Philippines*	387
Switzerland	129	*Korea*	1,998
Italy	160	*Taiwan*	968
Morocco	118	Public address systems ...	1,235
Flat irons	312	Recorders, all kinds ...	3,900
Venezuela	120	*Canada*	915
Cookers, household ...	980	*Venezuela*	184
Canada	290	*Iran*	610
Cuba	701	Bells, buzzers, alarms and parts	980
Ditto, parts	1,510	Starting and lighting equipment for cars and industrial engines ...	10,960
Canada	989	*Canada*	2,800
Household storage heaters	374	*Mexico*	680
Household appliances n.e.s.	1,408	*Venezuela*	755
Household heating appliances n.e.s.	660	*Brazil*	570
Furnaces, melting, refining	630	Iron and steel conduit ...	1,995
United Kingdom	57	Conduit fittings, outlets and switchboxes ...	2,760
Mexico	256	*United Kingdom*	87
Japan	153	*Canada*	760
Ditto, heat treating ...	476	*Venezuela*	284
Heating units and devices, industrial	1,290	Pole line, distribution and transmitting equipment	4,040
Canada	532	*Canada*	960
X-ray tubes and valves	526	*Cuba*	303
X-ray apparatus and parts	3,240	*Venezuela*	220
Canada	852	*Japan*	224
Mexico	135	Interior wiring devices ...	3,920
Cuba	183	*Canada*	1,320
Venezuela	386	*Cuba*	167
Brazil	161	*Venezuela*	228
Therapeutic apparatus ...	276	Fluorescent lighting fixtures	735
Radio and TV transmitting equipment	4,000	Incandescent lighting fixtures	1,141
Canada	493	Portable incandescent lamps	520
Mexico	341	Insulated cables and wires for building	1,578
Cuba	406	*Venezuela*	194
Norway	785	*India*	859
Japan	138	*Philippines*	231
Car radio receivers ...	8,040	Wires and cables, communication	5,470
Canada	152	*Canada*	290
Mexico	151	*Peru*	166
Venezuela	152	*Turkey*	484
Radiograms, not incorporating TV sets	307	*Korea*	2,920
Radio receivers, n.e.s., not incorporating TV sets ...	1,450	Portable cord, wires and cables	779
Canada	223	Wires, cables, rubber-covered, plain, braided, excl. those for building	2,240
Cuba	284	*Canada*	172
TV receivers	6,480	*Mexico*	184
Cuba	1,910	*Venezuela*	519
Venezuela	1,980	*Spain*	198
Argentina	235	*Philippines*	206
Switzerland	158	Wires and cables, varnish cambric insulated ...	183
Italy	347	Power cables, leaded or armoured	145
Electronic receiving tubes	5,970	Wires and cables, insulated n.e.s.	1,795
Canada	1,775	*Canada*	302
Mexico	700	Steam turbines	3,960
Cuba	199	*Canada*	443
Brazil	372	*Mexico*	454
Argentina	458	*Cuba*	140
Italy	281	*Sweden*	172
TV camera tubes ...	535		
Cathode ray tubes ...	4,920		
Canada	260		
Brazil	370		
Argentina	620		
Italy	181		
Belgium	235		
France	305		
Australia	655		
Electronic capacitors ...	1,194		
Canada	440		
Mexico	291		
Argentina	196		

TABLE 3.—(continued)

Product	Value (£000)	Product	Value (£000)
Steam turbines—*continued*		Steam and wat. eng.—cont.	
Belgium	485	*Mexico*	355
Japan	1,972	*Venezuela*	350
Water turbines	13	*Argentina*	174
Steam and water engines, turbine parts	4,560	*Italy*	420
Canada	635	*Saudi Arabia*	625
		Japan	344

TABLE 4.—UNITED STATES ELECTRICAL IMPORTS IN 1957
PRINCIPAL PRODUCTS

Product	Value (£000)	Product	Value (£000)
Generators and parts n.e.s.	352	Telephone apparatus ...	1,628
United Kingdom	26	*United Kingdom*	75
Canada	111	*Canada*	790
West Germany	48	*Sweden*	212
Switzerland	103	*Belgium*	243
Austria	40	*West Germany*	146
Transformers and parts ...	1,500	*Switzerland*	89
United Kingdom	745	X-ray tubes	129
West Germany	130	Photo-cell and electronic tubes n.e.s.	170
Austria	198	*United Kingdom*	48
Switzerland	181	*Holland*	53
Italy	171	Lead acid type storage batteries and parts ...	179
Convertors, generators, etc., dynamotors and parts n.e.s.	427	*United Kingdom*	61
United Kingdom	123	*Sweden*	60
Canada	136	*West Germany*	42
West Germany	41	Storage batteries and parts, except lead acid	255
Sweden	36	*France*	29
Japan	37	*Hong Kong*	133
Articles n.e.s. for controlling and rectifying electrical energy ...	1,740	*Japan*	71
United Kingdom	345	Flashlights and cases ...	532
Canada	698	*West Germany*	206
Holland	99	*Hong Kong*	300
France	38	*Japan*	28
West Germany	108	Furnaces, heaters, ovens and parts	432
Switzerland	191	*United Kingdom*	39
Japan	191	*Canada*	93
Motors, below 1/10 h.p. ...	730	*West Germany*	194
United Kingdom	181	*Austria*	38
Canada	228	Steam turbines	52
Japan	210	*West Germany*	7
Ditto, 1/10 to 200 h.p. ...	1,150	*Switzerland*	45
United Kingdom	960	Ditto, parts	89
Canada	87	*United Kingdom*	39
Belgium	39	*West Germany*	31
West Germany	38	*Switzerland*	16
Ditto, 200 h.p. and over ...	430	Washing machines ...	8
United Kingdom	16	Electrical goods and parts n.e.s.	725
Canada	397	*United Kingdom*	64
Ditto, parts	325	*Canada*	320
United Kingdom	180	*Sweden*	45
Canada	78	*Norway*	36
TV cameras, apparatus and parts	68	*West Germany*	54
Radio apparatus and parts	5,496	*Switzerland*	74
United Kingdom	675	*Japan*	36
Canada	270	Electrical machinery and parts n.e.s.	29,100
Sweden	58	*United Kingdom*	7,110
Holland	459	*Canada*	2,770
France	104	*Sweden*	650
West Germany	1,760	*Holland*	2,190
Switzerland	33	*Belgium*	605
Italy	61	*France*	835
Japan	1,990	*West Germany*	10,600
Telegraph apparatus n.e.s.	285	*Switzerland*	1,208
United Kingdom	77	*Italy*	1,400
West Germany	182	*Japan*	1,040

Radio Frequency Measurements

PUBLISHED for the Department of Scientific and Industrial Research by H.M. Stationery Office, price 1s 6d, No. 19 in the series "Notes on Applied Science" deals with signal generators, attenuators, voltmeters and ammeters at radio frequencies.

Twenty years or so ago instruments designed to give a signal of known amplitude were termed standard signal generators. The word "standard," which was meant to refer to the signal rather than to the generator, has now been dropped from most of the catalogues. The voltage values are usually engraved on the scales of the instruments, but it is obvious that these scales must be checked if the instruments are to serve as authentic standards or suppliers of known voltages. The present publication explains the procedures which have been adopted for calibrating such instruments. It has also some useful information on the calibration of attenuators and on the study of the behaviour of voltmeters and ammeters at radio frequencies.

INDUSTRIAL NEWS

Nuclear Plant for Japan

Reuter reports that the Japanese Atomic Power Generating Co. hopes to send a "letter of intent" to one of the three British nuclear power plant groups next month, "opening the way for negotiations on the supply of a £20 million atomic power generator." The report says that tape-recorded answers to technical questions given by representatives of the three groups who visited Japan last month would be examined by leading Japanese scientists, Government officials and company experts. It was hoped that this examination would be completed by the end of November and the company would then open the tenders of the three groups.

The report further says that failing the receipt of a loan from the World Bank to cover part of the cost, the company would ask the British supplier to provide credits to finance the importation of the reactor.

I.O.W. Council Reassured

Recently the Isle of Wight County Council suspended its approval of the erection of a radio station by the Air Ministry at St. Lawrence, near Ventnor, because of possible radiation danger to the public from the use of concentrated beams at very high frequencies. The Ministry has now assured the Council that it is satisfied, on the advice of the Medical Research Council, that at the proposed frequencies (from 30 to 300 Mc/s) there were only thermal effects and no biological effects or nuclear radiation, and that the power flux intensities near the transmitters would be too low to constitute any risk to the public. The Radio Correspondent of *The Times* reports that the Committee of the County Council concerned is seeking independent technical advice.

E.D.A. Public Speaking Competition

The British Electrical Development Association has announced particulars of its 1959 Public Speaking Competition. Three set subjects are offered, but should none of these appeal to the intending contestant a free subject may be chosen. The three set subjects are "Making the Money Go Further," "The History of Electric Cooking" and "Lighting as a Public Amenity." The competition is open to employees in the electricity supply industry who will be under thirty-five years of age on 31st March, 1959. Separate competitions will be held for men and women in their various areas, and those winners will then compete in the national finals in London. The closing date for entries is 31st December next. A booklet, "Public Speaking is Great Fun" (E.D.A. 1772 C), aimed at interesting potential participants in the competition, has been published. This, with entrance form, can be obtained through the Area Boards or direct from the E.D.A., 2, Savoy Hill, London, W.C.2.

Installation Testing

The borough surveyor of Bexhill recently reported to the Housing Committee that a charge of 30s per house would be required by the South Eastern Electricity Board for testing the wiring installations in the Council's pre-war houses, but that it would be possible to undertake the tests at an approximate cost of 10s per house. The Committee agreed that the tests should be carried out by direct labour.

Y.E.B. at Bakers' Exhibition

At the recent Bakers' and Confectioners' Exhibition held at the Drill Hall, Fenton Street, Leeds, the Yorkshire Electricity Board displayed a comprehensive range of appliances from baking ovens to café sets of particular interest to bakers and confectioners and commercial caterers generally. Great interest was shown in the electric bakers' ovens. One section of the stand was devoted to electric water heating. The organisers held competitions which attracted over 1,200 entries.

The stand of the Yorkshire Electricity Board at the recent Bakers' and Confectioners' Exhibition held in Leeds

British Lighting Council

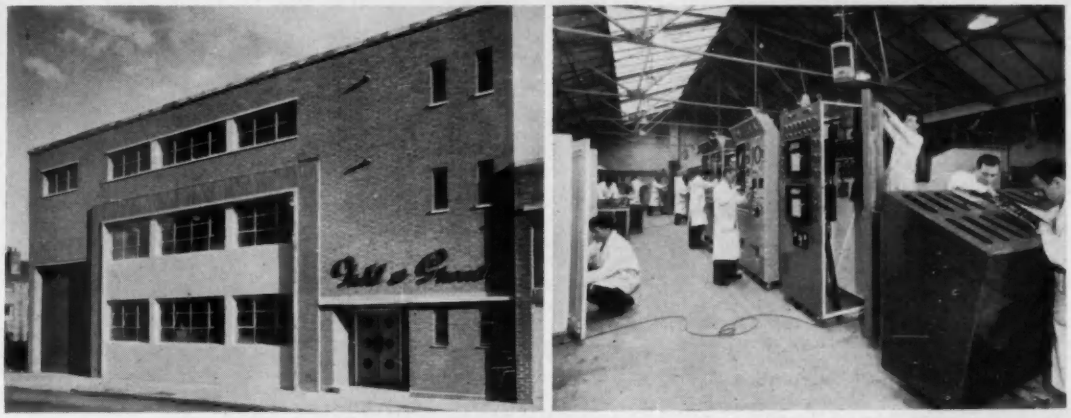
The second inaugural meeting of the South Western Region of the British Lighting Council was held in Cardiff on 30th October. Welcoming the audience, which included several members of the Electrical Association for Women, architects, consulting and works engineers, shopkeepers, and members of the electrical industry, Mr. H. Pryce-Jones (deputy chairman, South Wales Electricity Board) said there was ample scope for lighting development in that area. As a relatively new citizen he thought the street lighting in Cardiff was not up to the standard of that in some of the valleys, and hoped that early arrangements might be made for holding a street lighting conference, perhaps in conjunction with the Association of Public Lighting Engineers. The chair of the meeting was taken by Mr. W. A. Cooper (chairman, B.L.C. South Wales Advisory Committee) and the activities of the Council were outlined by one of its vice-chairmen, Mr. W. T. Souter. The meeting concluded with an illustrated talk on lighting development by Mr. E. B. Sawyer (secretary, B.L.C.).

Fabricating Beryllium

Some significant advances in the fabrication of beryllium for the nuclear engineering industry have been made by the Tube Investments technological centre at Walsall. Development work has been in progress at the centre's new laboratory for a year producing beryllium rod, wire and tubes. The longest small bore tube yet obtained has a bore of 0·3in, a wall thickness of 0·04in, and a length of over 2ft. A very thin-walled tube with a diameter of 0·7in and wall thickness of 0·012in has been made, and a range of tubes 8 and 10ft long, with diameters exceeding ¼in and wall thicknesses of 0·08in and above have been produced. Investigations are now proceeding to determine the material properties caused by different methods of processing to establish the best production technique for tubes in this metal.

Control Panel Production

The completion of an office block housing the sales, design and drawing offices at their works in Kent Street, Birmingham, is the latest stage in the development of Field & Grant, Ltd. The company, formed in 1945 with premises in John Bright Street, specialises in the design and manufacture of control schemes and the necessary equipment panels for applications including instrumentation,



The office block and cubicle assembly bay at Field & Grant's works

testing and motor sequence control. Construction of the various panels, desks and cubicles is carried out in the factory in two main bays. The first is a metal working shop, in which the stainless steel, mild steel or aluminium framework and panelling is made and erected. This is then passed through a painting booth to the assembly bay where the components and mimic diagrams are fitted and wired, the proprietary items used being selected for functional suitability. Operating and electrical tests of the completed system are also carried out in this bay prior to packing for dispatch. Equipments have been manufactured for Government authorities and the steel, chemical and food industries. Recently the company, in co-operation with Messrs. Hoare Lea & Partners, supplied the control system for laboratory supplies in Sheffield University.

Nuclear Power in Europe

Reuter reports that an agreement which will give the "Little Europe" community atomic power was signed in Brussels on 8th November by representatives of Euratom and the United States. Under the agreement, six to eight reactors, based on American designs, will be built during the next five years in France, West Germany, Italy, Belgium, the Netherlands and, perhaps, Luxembourg. The reactors will supply "Little Europe" with 1,000 MW of atomic power by 1963.

About three-fifths of the $350 million capital cost will be borne by private utility undertakings in the six European Atomic Energy Community countries. The rest will be provided by the United States Government in the form of long-term loans.

The agreement also provides for a ten-year joint research and development programme by the United States and Euratom to improve reactor performance and to lower fuel processing costs.

Reuter also reports that France will enter the world market for nuclear reactors this month with tenders for the first atomic power stations to be built in Holland and West Germany. The bids are for "Calder Hall" type plants which France has adopted as the basis of her atomic power programme. Three French nuclear industrial groups are said to be now in a position to tender for complete atomic power plants.

English Electric Window Display Contest

The English Electric Co., Ltd., has announced the winners of its national window display competitions. The panel of judges were Messrs. H. C. Timewell (manager of the company's domestic appliance division); C. T. M. Bagnall (publicity manager); F. A. Nicholson (managing director, Leggatt, Nicholson & Partners, Ltd.); A. Smith, F.S.I.A.. (display designer); and Miss Helen Burke (journalist). Winners of the two first prizes of £100 are the South Western Electricity Board, Kingswood, Bristol, whose theme was economy of cooking by electricity, and the Coventry Co-operative Society, whose display linked space travel and modern appliances, showing the influence of science on everyday living. In the Area Board section, the second prize of £60 goes to the Liverpool Service Centre, and the third prize of £30 to the Birkenhead Service Centre, North Wirral. Among entries from authorised dealers, the Northampton Co-operative Society gained the second prize of £60, and the third prize of £30 was awarded to Robb Brothers, Ltd., Birkenhead. In addition the company has made a number of special merit awards of £5 in each section.

The display of the South Western Electricity Board at Bristol which has been awarded first prize in the English Electric competition

Foreign Competition in Exports

For the past ten years the British Engineers' Association have published, at approximately yearly intervals, tables of figures showing the exports of electrical and mechanical engineering products from the eleven principal exporting countries to some 88 countries throughout the world. The supplement to *B.E.A. Information* dated 17th October is the latest in the series and contains figures for the years 1953-57 inclusive. These show that in 1957 the United States (£1,493·2 million) was again the largest single exporter and that West Germany (£854·9 million) had moved up to replace the United Kingdom (£788·3 million) as the second largest.

Data Processing

The continuing growth in the use of electronic computers and calculators, punched card machinery and other automatic aids to management and administration has raised a need for a guide to the subject for commercial

and industrial concerns. Consequently an announcement that the first issue of *Data Processing*, a quarterly journal devoted to all aspects of the subject, will appear in January next is to be welcomed.

The new publication is intended for management and administration executives and will be interpretative in its approach. The latest machinery—including such special apparatus as data-reduction and logging equipment—will be described. Current operational practices will be analysed and presented in a form which will enable management and administration executives both to appreciate these methods and to apply them to their own particular problems.

Data Processing is to be published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, at 25s per copy (annual subscription £4; U.S.A. and Canada $12).

Production Plant Manufacture

In the new engineering department recently established at the Mitcham works of the Mullard Radio Valve Co., Ltd., specialised plant, machines and tools used in the making of radio valves, television and instrument tubes, semiconductor devices and magnetic ferrites are designed and developed. In addition the routine mechanical maintenance of such plant is undertaken, and apprentice engineers receive training for work in the department.

In the tool-room, where all types of hand and power operated press tools are manufactured, a fully automatic spark-erosion machine has been installed to produce precision tungsten carbide dies for valve parts, accurate to one-hundredth part of a millimetre.

General view of part of the new engineering department of the Mullard Radio Valve Co.

Machines for valve and cathode ray tube production, built and maintained in the machine building shop, include a 12-head valve sealing machine and an automatic equipment for assembling the crystals of a germanium diode in the glass envelope. A high-speed variable pitch winder for frame grids, a component used in some of the latest valves, has been developed to wind 145 turns of wire only 10 microns thick on a frame 7·5 mm long, with unequal turn spacing.

South of Scotland Electricity Board's new workshops at Motherwell

Scottish Board's New Motherwell Premises

The South of Scotland Electricity Board has built new workshops in Leven Street, Motherwell, which were officially opened by Provost Bernard Brogan, J.P., on 5th November. The new premises consist of a domestic apparatus repair workshop, transformer storage and test department, garage and other workshops.

The repair workshop has been built in the the three-storey section of the new building. In the Lanarkshire Area there are 29,000 cookers, 15,000 water heaters and 7,000 wash boilers serviced by the Board under maintenance agreements with local authorities and private consumers. The workshop area covers 3,000 sq ft, the ground floor accommodating the appliance reception area, the cooker reconditioning department and the electrical testing equipment, the first floor catering for the repair of washing machines, refrigerators, wash boilers and other sundry appliances.

The transformer storage and test department has been designed to carry out complete servicing and repairs of the 2,450 transformers now in commission in the area. A special feature is a transformer cleaning pit and oil pump and filter room, interconnected by a pipe-work system to four bulk storage oil tanks each of 1,200 gallons capacity situated outside the building. Complete electrical tests are operated from a control room overlooking the new test bay. The transformer storage space provides accommodation for up to 350 distribution transformers, and room is also provided for the storage of all types of system protective equipment, relays and associated apparatus, whilst repairs and maintenance to communication equipment can also be carried out in this new department.

The Board has a fleet of 135 vehicles to service and a large number of portable mechanical tools to maintain and the new garage has been designed in four main sections.

A joiners' shop has been accommodated in the new building together with a painters' workshop and linesmen's workshop for the Motherwell District. An engineering and electricians' workshop has also been provided, and a blacksmiths' shop for carrying out welding and other metal work for the whole of the Area has been included.

The new building is equipped with an under-floor heating system with a loading of 485 kW. This is augmented by a number of fan heaters (40 kW) in the transformer test department.

Newcastle to Burnmouth Resignalling

The Westinghouse Brake & Signal Co., Ltd., has received the largest contract for signalling equipment ever placed by British Railways. It comprises the supply and installation of 4-aspect colour-light signalling between Newcastle (Heaton) and Burnmouth on the east coast main line, a distance of 70 miles. Westinghouse O.C.S. route relay interlockings are to be provided at Heaton, Benton and Tweedmouth and three "Westronic"

C.T.C. installations are also included. The whole scheme is designed to be suitable for operation with 25 kV a.c. traction and comprises approximately 400 main colour-light signals, 500 "Westlyte" shunt signals, 200 sets of power operated points, 900 track circuits and 300 O.C.S. routes.

Supergrid Contract

The Central Electricity Generating Board has placed a contract with W. T. Henley's Telegraph Works Co., Ltd., for the supply and erection of approximately 17 miles of 275 kV overhead line, as an extension to the national supergrid, over a route which has still to be determined, between Hinkley Point and Taunton.

Trade Unions in 1957

Part 4 of the 1957 Report of the Chief Registrar of Friendly Societies deals with the finances and operations of the trade unions during the year. It shows a total of 8,593,000 members at the end of 1957, against 8,549,000 at the end of 1956. Among the larger unions, the membership of the Electrical Trades Union is shown to have risen by 4·9 per cent to 239,000 (including 15,000 females). In the case of the Amalgamated Engineering Union the increase was 2·1 per cent to 982,000 (66,000 females).

Of the total expenditure by the unions of £24,382,000, payment of dispute benefit amounted to £2,971,000, the highest in any year since 1926. It was largely accounted for by the 15-day stoppage in the engineering and shipbuilding industries.

Three cases are reported of complaints of breaches of the rules relating to political funds. In one of them a member of the E.T.U., Mr. J. H. Valentine, complained that although he had claimed exemption from contributing to the Union's political fund as from 1st January, 1956, by giving notice in August, 1955, the Union had debited him with a contribution of 1d a week since 1st January, 1956.

Mr. Valentine said that his claim was made on a slip of paper in the exact wording prescribed in the Union's Rule 32(4). The slip was later returned to him on the ground that the claim was not on the printed form of exemption notice provided by the Union. He then filled in a printed form and returned it. When, seven months later, he found that he was still being debited with the contribution he made inquiries and was informed that the branch secretary had not received an exemption notice.

Mr. Valentine's statement was not challenged by the Union and the Registrar accepted it as true. He found that Mr. Valentine had complied with the rules and ordered that he was to be exempt from contributing to the political fund with effect from 1st January, 1956.

Part 4 of the report is available from the Stationery Office at 3s.

E.D.A. Industrial Conference

The second E.D.A. Industrial Conference was held at Porthcawl from 28th October to 1st November and was attended by over 100 delegates from Electricity Boards and undertakings in the United Kingdom, Northern Ireland and Eire. Delegates discussed a number of papers, held syndicated discussions, and spent two whole days visiting factories and studying modern electrical production methods.

New London Transport Traverser

A new traverser for the movement of Underground cars undergoing overhauls, which embodies advanced features of design, has been installed recently at London Transport's Acton Works. It replaces one which was installed in 1922, when the works first opened. Close control at all speeds and loads is provided by the use of a Ward-Leonard drive, the incoming supply being taken from the 600 V d.c. traction system via overhead wires. The winch is driven by a separate motor, and a single controller is provided which can be applied at will to either the travelling or the hauling motor by the use of a changeover switch. The winch is angled to provide adequate clearance from vehicles carried on the traverser, and to ensure that the line of pull of the hauling rope is normal to the axis of the rope drum. Instead of the conventional arrangement by which all wheels at the driving side of the machine are mounted directly on a common shaft, each driving wheel is mounted on roller bearings on a short axle mounted in a pair of roller bearings and carries an independent gear ring driven by a pinion on a cross-shaft. This enables any wheel to be withdrawn independently for maintenance purposes.

The electrical equipment is mounted at low level, the motors and generators being contained in external housings with removable top and side covers, and the cabin is consequently of unusually small size and allows a clear field of view in all directions. The traverser, which has a load capacity of 61½ tons, was built by Stothert & Pitt, Ltd., to the specification of London Transport. The electrical equipment was supplied by Laurence, Scott & Electromotors, Ltd. The installation has been carried out to the requirements of Mr. A. W. Manser, chief mechanical engineer (railways), London Transport.

The new traverser at the Acton Works of London Transport

London Electric Wire Co.'s Acquisition

The London Electric Wire Co. & Smiths, Ltd., announces the purchase from Mr. P. Millett and Mr. L. Levens of a controlling interest in the Millett, Levens Group, which includes Printed Circuits, Ltd., and Millett, Levens (Engravers), Ltd., of Borehamwood, Herts. Mr. Millett and Mr. Levens will both retain shareholding interests in the companies and will continue as joint managing directors. Mr. E. L. Wildy is appointed chairman of the group and other directors are Mr. K. W. Marten and Mr. D. R. Cornwell.

Trade Announcements

E. J. Wilcock, Ltd., Birmingham, have joined the electrical division of the Deritend group of companies. The existing electrical firms in this group are the Midland Electric Installation Co., Ltd., Shoolbred Electrical Co., Ltd., and Shoolbred Rewinds, Ltd.

Mr. B. F. Mullen has joined the sales staff of the **A.E.I. Lamp & Lighting Co., Ltd.,** Leicester area office at 5, Campbell Street, Leicester. Previously he was a sales representative for both the Lamson Paragon Supply Co., Ltd., and the Reliance Telephone Co., Ltd.

The **British Central Electrical Co., Ltd.,** has appointed Mr. P. Gould as technical sales representative for the eastern area. Mr. Gould was lately on the sales staff of William McGeoch & Co., Ltd.

The **Midland Coil Winding Co., Ltd.,** has moved to a new factory wing in the Pensnett Trading Estate, Brierley Hill, Staffs.

Morphy-Richards, Ltd., are giving a free flex support with each steam-and-dry iron purchased in the United Kingdom during the period 28th November to 31st December.

The head offices of **A.E.I.-Hotpoint, Ltd.,** and **A.E.I.-Gala, Ltd.,** are now at 33, Grosvenor Place, London, S.W.1.

General view of Caltex House

Caltex House is a large modern office block which was recently erected at Knightsbridge, London. The electrical distribution system in this ten-storey building is a good example of modern installation practice and is described in detail in this article

ELECTRICAL DISTRIBUTION IN A LARGE BUILDING

By P. A. BELL, A.M.I.E.E.*

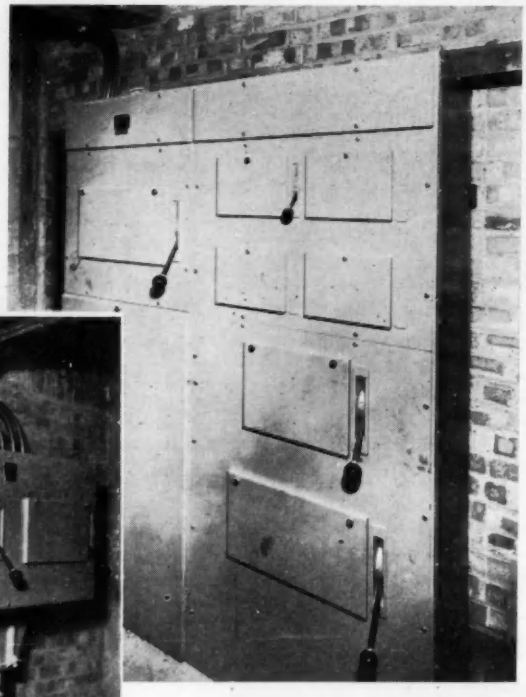
MODERN INSTALLATION PRACTICE

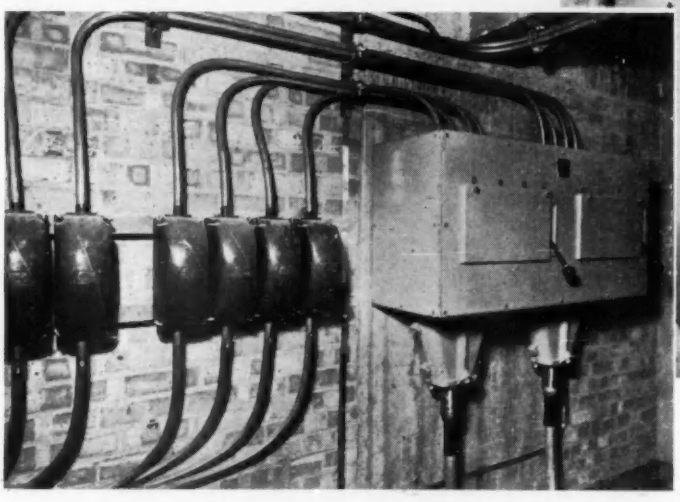
A GOOD example of modern electrical installation practice is provided by the main and sub-main distribution systems recently installed in Caltex House, an imposing new office building which has been erected on the site of the old Tattersall's Club on Knightsbridge Green, at the junction of Knightsbridge and Brompton Road, London. The architects were Messrs. Stone, Toms & Partners, while the main contractors were Sir Robert McAlpine & Sons, Ltd., who also designed the electrical scheme. The electrical installation was carried out by Edmundsons Construction Co., Ltd.

Caltex House is of reinforced concrete construction with brick and stone cladding, and consists of a central ten-storey block with four six-storey wings. The total floor area is 228,500 sq ft, and of this the basement area, comprising 19,500 sq ft, is intended for indoor car parking. Various services, including the electrical switchrooms, are also housed at basement level.

The building in its final form being almost exactly symmetrical, the distribution system divides conveniently into two "risers" at the east and west ends respectively (see Fig. 1). Since all floors above the basement are intended for sub-letting, each riser, therefore, consists of: (a) landlord's distribution, metered in bulk, and (b) tenants' distribution, metered locally for each tenant.

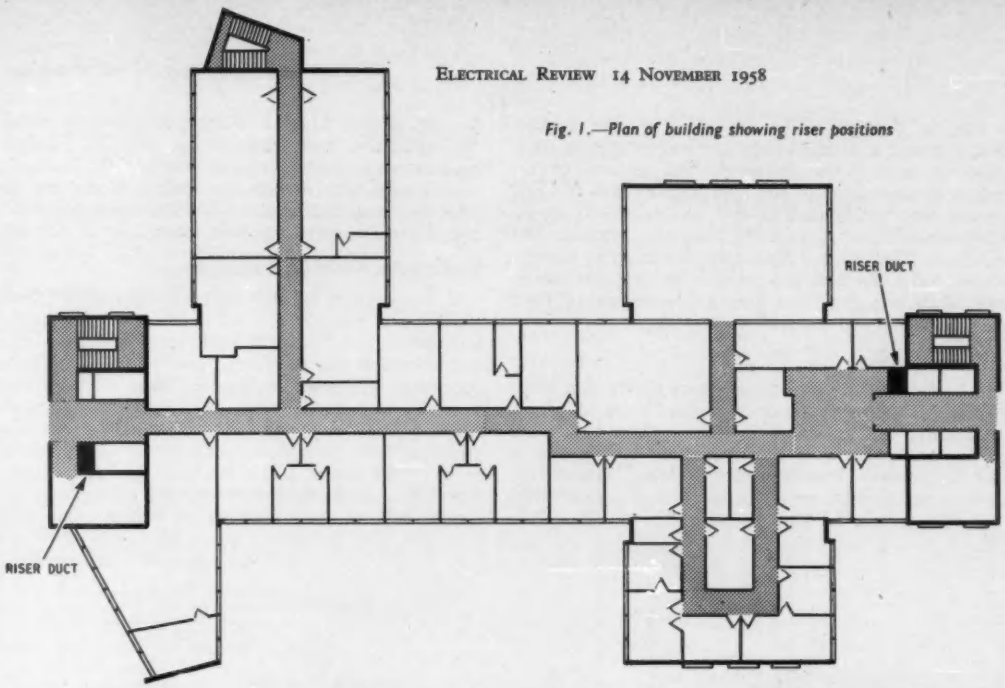
* Ottermill Switchgear, Ltd.





Control equipment in the east switchroom

Fig. 1.—Plan of building showing riser positions



A three-phase four-wire supply at 400/230 V, 50 c/s is provided by the London Electricity Board from three 200 kVA single-phase transformers connected to form a 600 kVA bank, housed in an intake room at the west end of the basement. From the transformers the supply is taken via the main medium-voltage 800 A air circuit-breaker to a skeleton pattern h.r.c. distribution board with 600 A fuse units. From this board, six main circuits in all are taken in 0·3 sq in single v.c.l.c. cables to the east and west switchrooms at basement level, terminating in 400 A service cut-outs (see Fig. 2).

Riser Cupboards

It was decided in the initial stages of design that all distribution gear associated with each riser should be grouped together at one position on each floor. Apart from ensuring a neat and unobtrusive installation, it was felt that this arrangement was the most convenient for meter reading, maintenance, general control and future modification. A substantial riser cupboard with double doors was therefore provided adjacent to the east and west staircases respectively on all floors above the basement. These cupboards have internal dimensions of 6ft 6in by 2ft 6in and occupy the full floor to ceiling height. The cupboards are in vertical alignment and are joined by a duct rising from ground floor ceiling to tenth floor level.

Landlord's System

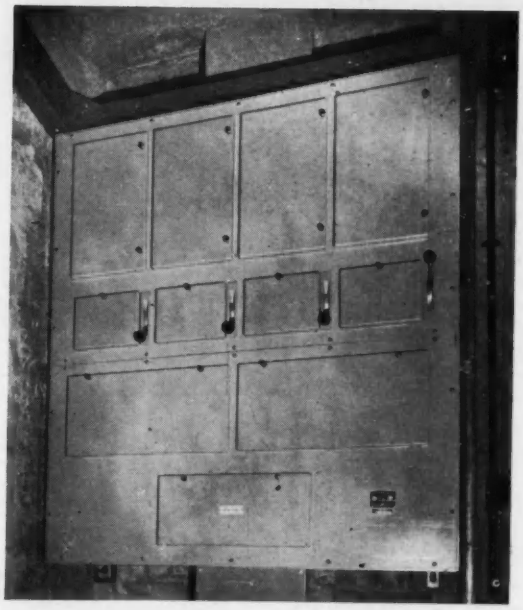
The landlord's distribution system is shown diagrammatically in Fig. 2, and serves:—(a) lighting and socket-outlets in basement, staircases, landings, lavatories, etc.; (b) lifts; and (c) boiler house and ventilation plant. The east and west side systems are very similar, each comprising a switchboard in the basement switchroom, feeding to various rewirable distribution fuseboards, etc. The switchboards are of the cubicle type with air-insulated busbars, incorporating q.m.q.b. h.r.c. fuse-switches, and providing accommodation for the L.E.B.'s metering.

Sub-mains to the distribution boards consist of 250 V grade p.v.c. insulated cables enclosed in steel trunking. The fuseboards at third and eighth floor levels are housed in the riser cupboards and the cable trunking for both sub-mains and circuit wiring rises vertically through the duct.

Tenants' System

The two risers are identical, each serving approximately half of each floor. Fig. 3 illustrates one riser diagrammatically. The height of the building made it inevitable on economic grounds that some system of "rising main" should be employed; and considerations of adaptability, robustness and limitation of voltage drop led to the choice of copper busbars for this purpose.

Inside each riser cupboard is provided a floor distribu-



Floor distribution cubicle installed in riser cupboard

tion cubicle through which the rising busbar ducting passes, forming a mechanically continuous system from ground to tenth floors inclusive. All tenants' circuit wiring is brought back to the appropriate (east or west) cupboard and terminated in the cubicle which incorporates sub-main fuses, metering chambers, isolators and distribution fuseboards. Maximum flexibility is thereby provided, since the final sub-circuits can easily be reconnected when a tenant takes over a new section of floor with its associated lighting and power points.

Busbar Ducting

The busbar ducting incorporates four 2in by $\frac{3}{16}$in hard-drawn high-conductivity copper busbars rated at 400 A continuously, air insulated with paper-based Bakelite supports, and enclosed in a folded sheet steel duct with removable covers. Interfloor (fire-resisting) barriers are built into the duct where it passes through a floor slab, in accordance with I.E.E. Regulation No. 212(B). The ducting, in fact, consists of short lengths interconnecting the successive floor distribution cubicles. Laminated expansion joints are provided between the bars of each cubicle and the bars of the length of ducting above; solid disconnecting links are fitted at the opposite (lower) end of the cubicle, and permit segregation of any section.

Floor Distribution Cubicles

It was decided initially that any floor from ground to sixth inclusive might be divided into a maximum of eight tenancies on an "all-in" tariff (four per riser). A four-circuit cubicle was therefore provided for each cupboard, connected as shown in Fig. 4. Each circuit comprises a twelve-way 30 A single-pole and neutral rewirable fuseboard with 60 A q.m.q.b. on-load isolator, a sealable chamber with provision for a direct connected house service kWh meter, and a sealable h.r.c. 100 A sub-main fuse unit. Each floor is connected throughout on one phase only, to avoid phasing difficulties. The cubicles

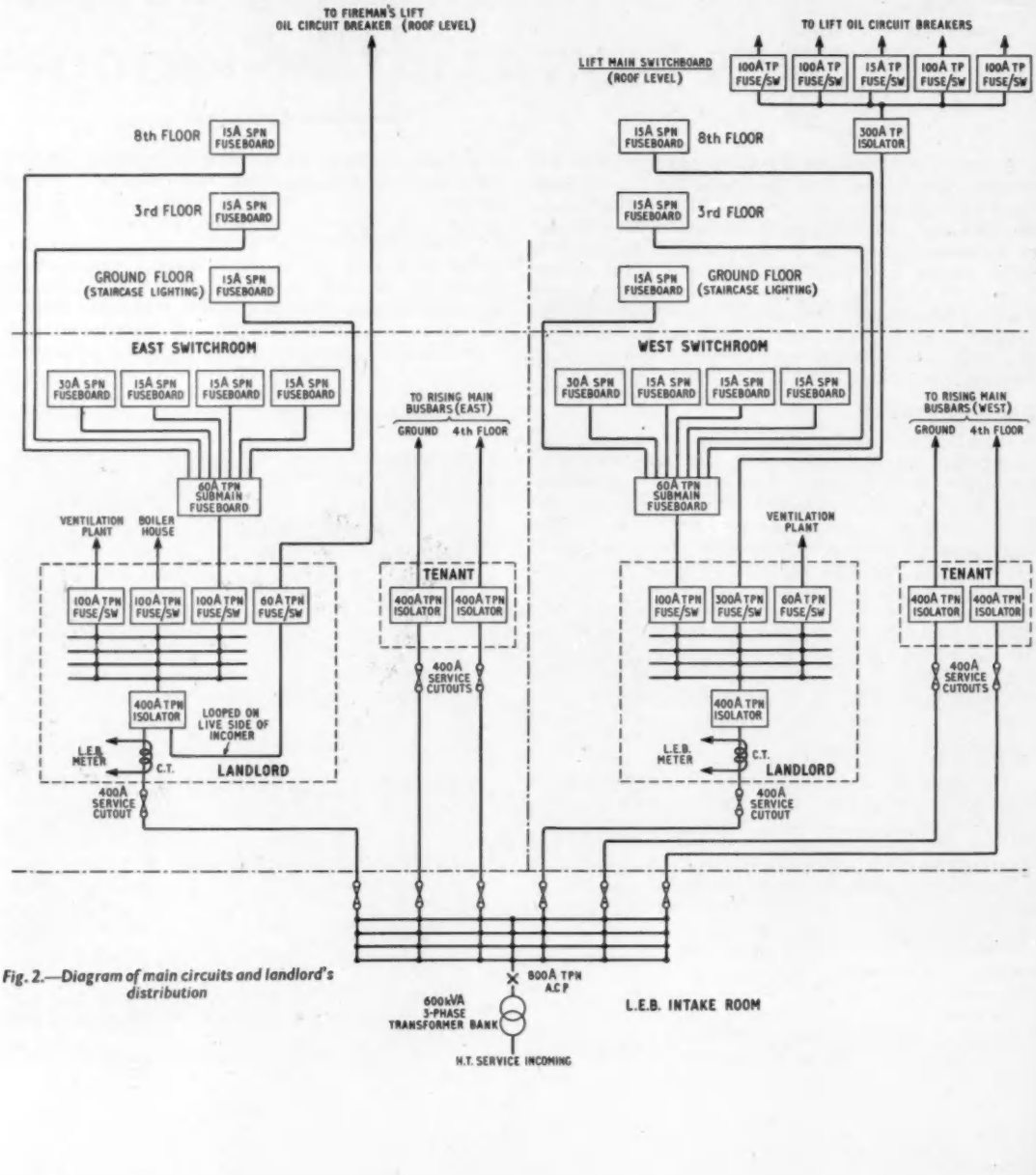


Fig. 2.—Diagram of main circuits and landlord's distribution

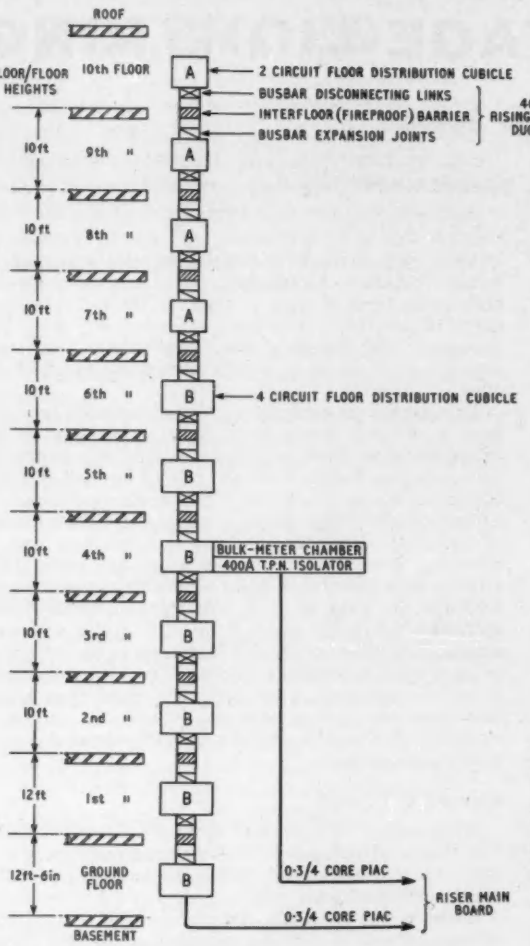


Fig. 3.—Diagram of tenants' rising main system (one riser)

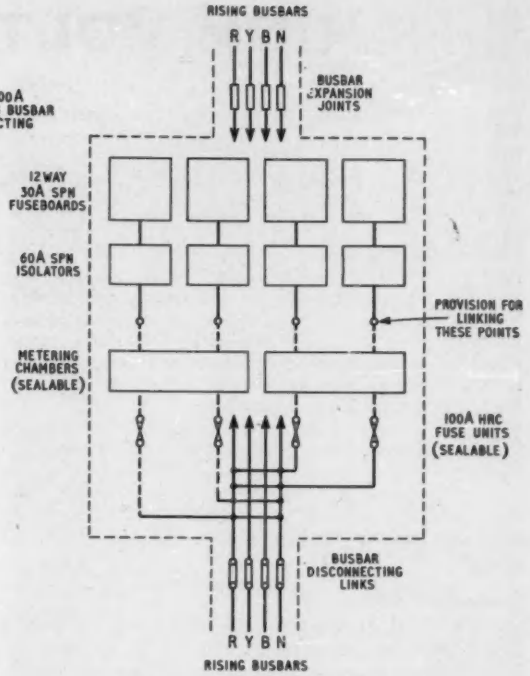


Fig. 4.—Diagram of typical floor distribution cubicle

are wall-mounting, constructed of mild steel angle and sheet steel, and finished in stove enamel. All gear is removable from the front for access to bars, wiring and internal connections.

Where a tenant requires one distribution fuseboard only, the sub-main unit is fused at 60 A by the L.E.B., who install the meter. Provision is also made for linking two or more of the isolators on the "live" side and feeding from one sub-main fuse, where a tenant requires more than one of the fuseboards on one meter. In this case (with a 100 A fuse) the maximum permissible load per tenant per cubicle is 24 kVA, which was considered ample for lighting and socket-outlets. The upper floors, being smaller in area, have provision for two tenants per cubicle (four per floor).

Two feeds consisting of 0·3 sq in four-core p.i.a.c.s. are taken to each riser, at ground and fourth floors respectively. These virtually increase the riser capacity to 800 A per phase and may operate either separately or in parallel. A meter chamber is fitted to the fourth floor cubicles at the additional feed point, to permit bulk metering of the upper floors.

All the landlord's and tenants' distribution gear and rising main equipment which have been described above were supplied by Ottermill Switchgear, Ltd., of Ottery St. Mary, Devon.

Acknowledgment is due to the following, both for information supplied, and for permission to publish this article:—Messrs. Stone, Toms & Partners; Sir Robert McAlpine & Sons, Ltd.; Edmundsons Construction Co., Ltd.; and the London Electricity Board (Western Sub-Area).

Aluminium Alloy Defects

MANY more defects can exist in aluminium alloys than in mild steel, mainly because the former materials can be fabricated by several different processes, and as aluminium alloys are so important in the electrical industry to-day it is safe to say that a logical system for classifying the defects is an important electrical development. Such a system is described in a new booklet (H3/58) entitled "Classified Radiographs for Defects in Aluminium Fusion Welds" recently published by the British Welding Research Association. It shows how to identify those defects in aluminium fusion welds which can be seen in radiographs. The defects are classified, their origins explained and suggestions for their prevention are made.

The defects are placed in five major groups as follows: Cracks; lack of fusion, including incomplete root penetration; voids, including the three types of porosity, uniform, localised and linear, as well as elongated cavities and crater pipes; inclusions of oxide, flux or metal, the last-named being usually tungsten but sometimes copper or iron; imperfect shape, including defects which may, or may not, be seen on visual inspection, depending on the joint design, such as undercutting, excessive penetration and root shrinkage.

HIGH VOLTAGE LIGHTNING

Design Trends in America and Britain

By R. G. TERRY, A.M.I.E.E., and K. DANNENBERG, Dipl.Ing.*

THE term "lightning arrestor" is generally used in America where high isokeraunic levels coupled with extensive overhead distribution and transmission systems have justified concentration on design and development of this type of protective equipment. The title "surge divertor" in common use in Europe is perhaps a better one, however, as improvements in design have extended the range of application.

Modern designs of valve type arrestors have established their superiority over other kinds for transformer protection. They can properly be regarded as insurance against damage to capital plant and discontinuity of supply. For this reason it is not surprising that the development of the valve type arrestor has been affected by economic as well as other technical considerations.

Classification

High voltage lightning arrestors in America are divided into three categories as defined by A.I.E.E. 28, namely, distribution, intermediate and station. These three types are designed to handle different maximum levels of surge current and duration and the choice of type is roughly determined by the value of the plant to be protected and the voltage. While this at first glance may not seem entirely logical, it has to be remembered that the extent of any disturbance to the supply due to insulation failure is usually related to both these factors and the duty on the arrestor is determined, to some extent at least, by the impulse flashover level of the line insulation.

The distribution type arrestor is a light and inexpensive model used mainly for the protection of single-phase, pole-mounting transformers. The intermediate type, or as it was called until quite recently, the line type, is commonly employed for the protection of smaller substations. The station type is capable of handling the more onerous surges which can enter a station via high voltage transmission lines and is employed for the protection of major capital plant.

Rating

Apart from classification by type, each arrestor is rated by voltage. The voltage rating refers to the maximum line-to-earth voltage which the series gaps can be expected to reseal after the arrestor has dissipated a surge. This voltage should never be exceeded and its relationship to the circuit voltage depends upon system neutral earthing, etc. It is usual in America to allow a safety factor of 5 per cent and in Britain one of 10 per cent over and above the line-to-line voltage when arrestors are employed on an unearthed neutral system. It is common to reduce this rating by 20 per cent when the arrestors are used on a system with an effectively earthed neutral, although in exceptional cases a reduction of 30 per cent is considered.

Construction and Operation

The most usual construction of arrestors to-day consists of a glazed wet processed porcelain insulator body inside of which are housed two main components which comprise the arrestor. These consist of series spark gaps connected in series with a special material possessing a non-linear voltage/resistance characteristic. This material is usually fitted in the form of discs or blocks in the higher voltage range of arrestor. The unit is sealed off from the atmosphere with metal end caps. Higher voltage arrestors comprise a number of such units stacked one on top of the other.

The arrestor is normally connected between line and earth at a point which is as close as possible to the equipment to be protected. Under normal system operating conditions it must fulfil the role of an insulator unaffected as far as possible by atmospheric conditions and normal system voltage fluctuations. Under the influence of abnormal voltage fluctuations, such as occur due to travelling waves on the line entering the station, the arrestor gaps must break down as quickly as possible and discharge the surge to earth. At the conclusion of this operation the system power-frequency current will continue to flow unless conditions favourable to the extinction of the arc can be created. The spark gaps must therefore be self-extinguishing. Arc extinction takes place either before or near current zero and is aided by the valve material which rapidly increases in resistance as the surge voltage is dissipated.

Electrical Design

While remaining insensitive to normal power-frequency fluctuations of voltage, an arrestor must react quickly to high rates of rise of voltage such as a lightning surge which is measured in microseconds.

In the course of its life, the arrestor may be subjected to surge currents of differing magnitudes and wave shapes. The design of the valve material is therefore important as these surges must neither produce damaging thermal effects within the arrestor nor overvoltages damaging to the system. The voltage drop across the arrestor while it is dissipating surge current is of great importance for the stress which it imposes on the connected apparatus. This voltage persists for relatively a much longer time than the voltage which causes gap breakdown.

The power system current which continues to flow to earth after the surge is dissipated, is known as the power follow current. Its value is limited by the normal system parameters and the resistance exhibited by the arrestor valve material at the available voltage. The value of the power follow current which is thus allowed to flow is of extreme importance as although small by comparison with surge currents which can be safely handled by the arrestor, the power follow current may persist for one half-cycle or nearly 8,000 microseconds on a 60 c/s system, or 10,000 microseconds on a 50 c/s system. The thermal effects on the valve material and on the spark gaps can be extremely damaging to the arrestor in course of time.

The arrestor should preferably have a life expectancy at least equal to that of the apparatus which it is designed to protect and, during its life, it should not deteriorate. This involves the design of the arrestor body, the spark

* E.M.P. Electric (Canada), Ltd.

ARRESTORS

Recent developments connected with surge arrestors include the production of better valve block material and improved sealing and stacking. Modern arrestors are considered so reliable and efficient that serious attention is being given to lowering the insulation of associated plant especially transformers

gaps and the valve material, for all are subject to change due to atmospheric and thermal effects. The arrestor should preferably be self-protecting, i.e., changes in voltage distribution over the external body of the arrestor caused by pollution should as far as possible be self-correcting.

During its life the arrestor should not influence adjacent communication circuits. In the event of the arrestor being subject to surge conditions beyond its designed rating, failure might be expected. It is important that such failures should take place with as little external manifestation as is possible.

Mechanical Design

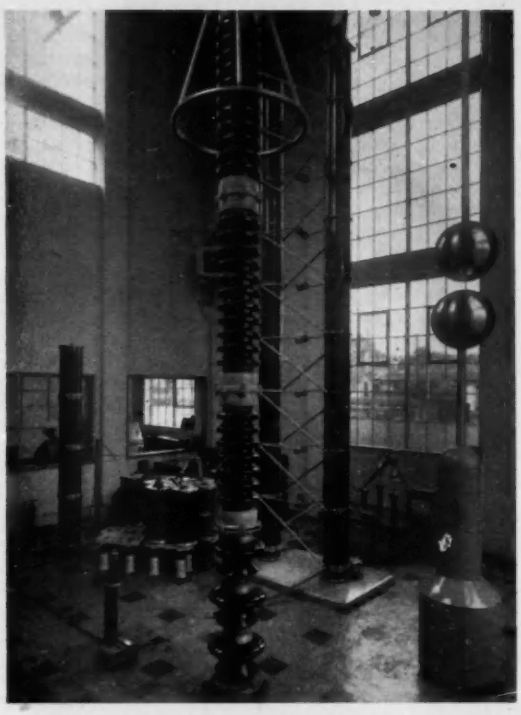
It is common to stack arrestor units for the higher voltage ratings. The arrestor must then possess adequate mechanical strength when, in the case of an unsupported construction, it is in a cantilever stress due to the weight, windage, etc., on the line connection. So that the arrestor may be applied at the most favourable point on the system it should be as compact as possible and the absence of external supporting members is a great advantage.

Electrical Performance Standards

Type tests which are set by the A.I.E.E. Code as a minimum standard for each arrestor class, have been formulated largely from empirical considerations and with due regard to wave shapes which can be readily reproduced in testing laboratories. While there is a large collection of data now available on surges produced by lightning, it remains a fact that the approach to minimum standards was a statistical one aimed at providing protection economically in the majority of cases. Recent improvements in design have allowed the leading manufacturers of arrestors to produce models which have a performance considerably superior to that dictated by the standards. Nevertheless, the standards themselves seem to have been justified as arrestors conforming to them have provided good protection for the majority of systems. There is now some evidence that this may not apply always on very high voltage transmission systems, but these may be considered as exceptional cases.

One British manufacturer has seized upon the logical advantage of superior design and has produced two classes of station type arrestors designated Class I and Class II. The Class II arrestor is the smaller and cheaper, but meets the minimum standards as designated by A.I.E.E. 28, while the Class I arrestor has superior performance and embodies a large safety factor, making it the finest form of insurance possible.

The Class I station type arrestor has followed the general trend in America by the use of larger diameter valve discs. This trend has been dictated by the necessity of obtaining improved performance and reduced discharge voltage with the heavy type of surges which are associated with transmission systems. At the moment, the 6in



A 145 kV arrestor being tested in the E.M.P. Electric laboratory

diameter valve disc is common for this superior type of station arrestor, but the minimum standards as defined by A.I.E.E. 28 can be met by a smaller valve disc of either 4½in or 3in diameter.

The tests which are specified by A.I.E.E. 28 consist briefly of (a) voltage withstand test of arrestor insulation, (b) power frequency sparkover which shall not be less than 1½ times the rated voltage of the arrestor when tested wet or dry, (c) front of wave impulse test, (d) impulse sparkover voltage time characteristics, (e) discharge voltage at various currents up to 20,000 A, (f) high current short duration discharge withstand tests, (g) low current long duration withstand tests and (h) repetitive test with surge currents, designed to reveal any deterioration in the arrestor performance. Circuits and procedures are outlined and in every case a wave shape is defined. Impulse sparkover, discharge voltage and deterioration levels are not defined specifically, but general attention in America is given to N.E.M.A. standards for lightning arrestors which detail industry averages within maximum and minimum limits for each type of arrestor, specifically for impulse sparkover and the discharge voltage.

Switching Surge Protection

For the average system, the A.I.E.E. tests have proved economical, but there are indications that further attention must be given to the low current, long duration tests for arrestors used on systems of very high voltage or with abnormal characteristics. Briefly, this type of test is designed to simulate the kind of surge that can be produced by switching. For station type valve arrestors, the minimum surge current is specified at 150 A, with the waveshape approximately rectangular and persisting for 2,000 microseconds. The test is repeated twenty times in groups of five impulses.

It is the duration and shape of this wave rather than

the value of the current which imposes thermal strain on the arrestor. There is controversy on the question of whether this test fulfils its aim. The switching surge is most properly evaluated primarily in terms of voltage, not current. When the voltage is high enough to spark over the lightning arrestor series gaps the current which flows through the arrestor is determined by the line voltage, the surge impedance, the ground resistance and the lightning arrestor resistance. Present tests, being specified in terms of current, may be useful for evaluating relative performance against long duration lightning but may be disproportionately severe on an arrestor specifically designed to limit crest values of follow current by the use of valve blocks of relatively high specific resistance. Such designs not only restrict follow currents but also switching surge crests. In terms of the levels now set by American standards, however, no difficulty is experienced in meeting and even exceeding several times the requirements of the tests. Nevertheless, some caution should be exercised when comparing the performance data of one arrestor against another for the reasons given.

Power Follow Current

From the above, it can be seen that the inherent resistance of the valve material at the arrestor rated voltage may have some influence on the arrestor's ability to influence the surge magnitude, but it undoubtedly has a greater influence in controlling the magnitude of the power follow current. The higher the resistance of the valve block the lower the value of the power system current which flows and therefore the less onerous the duty on the series gaps. The ideal valve block exhibits comparatively high resistance to the passage of current at system voltage and very low resistance when passing heavy current surges. The degree to which this ideal is accomplished is, of course, a measure of the non-linearity of the voltage/resistance characteristics of the valve block material and, because of the limitations of existing materials, arrestor designs are something of a compromise between high power follow current and low discharge voltage.

Competing designs of arrestors exhibit marked difference in this respect. The trend in American design is to produce valve blocks of comparatively low resistance in order to keep discharge voltage levels as low as possible. One British make of arrestor which enjoys great popularity in North America has a different approach. It employs a valve block material with a relatively high inherent resistance and a very marked non-linear voltage/resistance relationship, as a result of which power follow currents are kept to approximately half that in some American designs while discharge voltages are no higher than in the American designs. The advantage of this is, of course, to reduce wear on the series spark gaps. This is not only a point in favour of consistent performance, but of long life also. To combat this, American designs have had to resort to more elaborate methods of arc extinction. Thus magnetically controlled spark gaps are used but this naturally enough adds to the cost and there is a loss of simplicity.

Consistency of Performance

Under this heading, many things can be considered, such as effect of wear on the spark gaps, which has already been mentioned, and the influence of atmospheric pollution on the outer surfaces of the arrestor which is dealt with under a following heading. Greatest advances in this direction have been made, however, by improved methods of sealing off the arrestor components from atmospheric effects. Multi-compression seals have proved most effective for sealing the end caps to the porcelain body of the arrestor.

The spark gaps must receive special attention and frequently these are housed in a separately sealed porcelain chamber. Some American designs ensure that the gaps are enclosed in "dry air." The design of the British arrestor illustrated replaces the air with an inert gas thus removing any possibility of effects due to either condensation or oxidisation. Good design of the series spark gaps is, of course, essential for fast and consistent response to steep fronted waves.

The other requirement under this heading is that the valve block material shall itself be stable. Here the results of ageing are less important than the structural changes which can occur in the block due to repeated passage of surge currents. Such stability can only be proved by tests to destruction. The illustration shows a 145 kV station type Class I arrestor being tested in the laboratory of E.M.P. Electric, Ltd.

Quality control is extremely important in the production of the valve block material, but despite the most stringent precautions second order variations occur. Careful selection and testing can minimise these, but for this reason performance data are usually given in terms of the maximum tolerance allowed by the material, although sometimes average figures are given as well. The purpose of the average figures is a little obscure as in co-ordinating insulation it is not wise to intentionally allow destructive tolerances.

Voltage Equalisation

High voltage arrestors are usually made in pro-rated sections and stacked to produce higher ratings. The disposition of the series gaps within each unit tends to equalise the voltage distribution over the stack and for this reason arrangement of the component parts so that each pro-rated section is a complete arrestor in itself is preferred. Where arrestors are used outdoors, however, they are very often subject to atmospheric pollution. Surface deposits when dry may have a high resistance, but this may rapidly drop when wet. Under conditions of uneven resistance, such as would occur when an arrestor is subject to drying winds after a rainstorm, serious disturbance of the voltage gradient across the stack can take place. To correct this, some designs employ shunting resistors designed to pass a leakage current of approximately 1 mA while one American design also varies the spacing of series gaps. Thus, if the voltage over one section of the stack should build up to dangerous levels, the smallest spark gap is designed to break down and provide a voltage adjustment, this being repeated if necessary with breakdown of the second gap presumably until complete drying out of the arrestor stack restores normality to the voltage gradient across it. One British manufacturer uses non-linear voltage grading resistors across the spark gaps, designed in such a manner that when the surface leakage of one unit of a multi-unit arrestor stack is high, the increase in current through the remaining units scarcely alters the voltage distribution.

Reaction to Dangerous Surges

As it has already been pointed out, each design of arrestor has limited capabilities and even the heaviest station type arrestor is not necessarily designed to deal with a direct stroke in the vicinity of the arrestor. When an arrestor is subjected to voltages over and above its rated voltage or to currents which destroy it thermally, the surge is usually dissipated and the equipment protected, but the arrestor may fail, become damaged and during subsequent operations be destroyed. Such destruction can be

explosive and a modern trend is to provide pressure relief diaphragms to each section, which relieve the internal pressure before shattering of the porcelain body can occur.

On some designs of distribution type arrestors, the earth connection is designed to drop away when the series spark gaps in the arrestor do not interrupt the power follow current within the normal time. This is accomplished either by detonating a small explosive charge or by blowing fuse links. These arrangements can be made to discriminate with quite small fuse links and serve several purposes as they prevent the arrestor from being destroyed while at the same time disconnecting it from the line and preventing service interruption. The disconnected earth lead serves as a visible signal to line patrolmen that the arrestor is damaged and needs replacement. This feature has become extremely popular in America where this type of arrestor is used extensively.

Summary

Over the last few years the greatest advances have been made in the production of better valve block materials and the trend has been towards valve discs with greater operating efficiency to provide maximum protection with minimum discharge voltage. In some cases this has led to greater power follow currents and greater complexity of gap designs. Low power follow current remains desirable.

Improvements in construction have concentrated on improved sealing against atmospheric effects and more compact stacking arrangements at the higher voltages. Voltage distribution across the stack is another matter which has been given more attention by designers.

Modern lightning arrestors are now considered so reliable and efficient that serious attention is being given to lowering the insulation level of associated plant, especially transformers. Great savings in insulation costs can be achieved by efficiently co-ordinating system insulation and protection with arrestors. Other advantages may be obtained as the reactance of a transformer is very much associated with its insulation level and in turn the losses are related to the reactance.

The development of station type arrestors for systems above 200 kV or systems where exceptional circumstances exist will no doubt proceed from increased operating experience. It is, however, on the lower and more frequently used transmission voltages that further economy in arrestor design might be most useful. Lack of statistical data on the individual system is at present tempting the supply engineer to take out the best insurance possible regardless of arrestor cost as this is generally a small proportion of the capital cost of the plant to be protected. Such thinking is no doubt justified at present, for apart from capital cost the loss of continuity of supply does not justify second order economies.

There exists a need for a "geophysical" approach to the task of collecting and collating data on arrestor operation and mal-operation. To this end present tools need improvement and there is a real need for a cheap surge recorder which would be both qualitative and quantitative and yet need infrequent attention. When such a tool is marketed, supply authority engineers must be persuaded that it is to their ultimate advantage to fit it wherever possible so that the economies obtainable from closer limits of design can be realised.

New Higher Technological Award

THE National Council for Technological Awards (9, Cavendish Square, London, W.1) announced last week that in order to encourage qualified men and women to undertake further study beyond the level of the Diploma in Technology and carry out original investigations, it has decided to create a higher award which will be a mark of outstanding distinction granted to a student who has proved his ability by completing a substantial programme of work demanding the application of his knowledge to the solution of a problem of value to industry.

The Council is to establish a College of Technologists, and the new award will take the form of membership of this College (M.C.T.). To qualify, a student must undertake a programme of work to be carried out jointly in industry and at a technical college. This programme may be concerned with any technological aspect of industrial activity, such as research, development, design, production or market investigation. The Council believes that to carry out successfully post-diploma work of this character, students must remain in contact with industry or with commercial laboratories.

Before starting on a programme a student must apply to the College of Technologists, through the technical college at which he will study, to be registered as a candidate. The College will consider particularly the qualifications and experience of the student, the suitability of the programme offered and the arrangements to be made for carrying out the work both at the technical college and in industry.

The programme offered should be related to the student's personal experience in industry and must have the approval of his employer. Its nature must be such that it is likely to result in a useful contribution to technological knowledge. The Council suggests that a three-year period of work would cover its requirements, provided a high proportion of a student's time is devoted to the programme. The Council hopes that employers will readily see the advantage of sponsoring such investigations and give students time for them.

Registration of candidates will not be restricted to holders of a Diploma in Technology, but may be extended to holders of equivalent qualifications. Teachers in technical colleges will be encouraged to become candidates. The student's work must be supervised by a staff member of the technical college at which it is undertaken and by a staff member of the industrial organisation concerned. The technical college will be responsible for the examination of candidates seeking membership of the College of Technologists, subject to any general arrangements, including the approval of external examiners, which may be prescribed by the College.

There may be cases where it would be more appropriate for a holder of the Diploma to pursue his studies at a university and the Council says it is most gratified to know that the Committee of Vice-Chancellors and Principals has strongly recommended to universities in the United Kingdom that, in suitable cases, holders of the Diploma in Technology should be on the same footing as holders of first degrees when application for admission to courses of study for higher degrees are being considered.

NEW ELECTRICAL EQUIPMENT

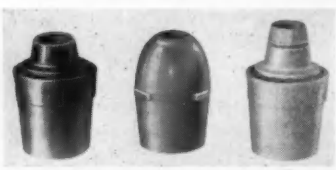
Insulation and Continuity Tester

The "Metrohm" tester introduced by EVERETT EDGCUMBE & CO., LTD., Colindale Works, Colindeep Lane, Hendon, London, N.W.9, has facilities for making insulation, resistance and continuity tests, a rotary switch being provided to select the appropriate test.

A transistor-operated voltage convertor is used for the insulation resistance range, obtaining power from a 9 V battery pack with plug-in contacts which is used as a direct source when making continuity tests. This gives a high conversion efficiency, low current drain on the battery, reduced ripple content, and improved regulation over the working range. The instrument calibration may be adjusted as the voltage of the battery falls after use.

The use of a Bakelite printed-circuit chassis to which the various components are fixed has resulted in an instrument which, weighing only 2½ lb and measuring 7¼in by 4⅝in by 3in, can be held in and operated with one hand. It is available in models for three output voltages, 500, 250 and 100 V d.c. with insulation ranges of 0·15-50, 0·1-25 and 0·03-10 MΩ respectively. The 500 V instrument, complete with leather strap, detachable polythene front cover, 5ft test leads and instruction book giving some practical test details, is marketed at a list price of £21 12s.

Everett Edgcumbe "Metrohm" tester



Some of the designs in the Nettle Accessories new lampholder range

Metrix Type 460 multimeter

Lampholders

A range of contemporary styled lampholders, available in black, dove grey and white, has been announced by NETTLE ACCESSORIES, LTD., Warren Street, Stockport, Cheshire. The new shapes, which are both smooth and pleasing, enable the lampholder to stand on its own, unshrouded and outside a fitting, without detracting from the installation. Except in the case of the all-moulded lampholders, the use of coarse threaded porcelain interiors has been retained. The prices range from 20s to 58s per dozen, depending on the type and colour.

Pocket Multimeter

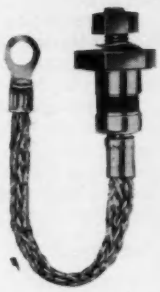
A light, compact and portable pocket multimeter, the Type 460, has been announced by METRIX INSTRUMENTS, LTD., 54, Victoria Road, Surbiton, Surrey, priced at £13 4s. The moving coil meter consists of a Ticonal magnet and ultra-light, critically damped shock-proofed movement, having a sensitivity of 90 microamps full scale deflection, and a 3⅜in long scale with a knife edge needle and antiparallax mirror. The internal resistance is 10,000 Ω/V on both a.c. and d.c. ranges and the accuracy is 1·5 per cent on d.c. and 2·5 per cent on a.c.

Twenty-eight ranges are offered including 0-750 V a.c. and d.c., 20 μA to 1·5 A a.c. and d.c., and 0-2 MΩ in two ranges. A leather operating and carrying case is available for the meter, which has dimensions of 5⅝in by 4in by 1⅝in. Accessories offered include a 15 A shunt clip-on transformer for currents up to 1,500 A a.c., a 1·5-7·5 kV voltage multiplier and a 15/30 kV probe.

Germanium Power Rectifiers

A series of hermetically sealed indium alloyed germanium power rectifiers has been announced by SYLVANIA-THORN LABORATORIES, LTD., Great Cambridge Road, Enfield, Middlesex. The unit is in the form of a post assembly with an integral stud mounting and a top flexible eyelet connection, with a flying lead terminal if required. The base stud acts as the cathode connection. Ceramic insulation is employed capable of withstanding a high degree of mechanical stress and preventing moisture ingress.

Diodes of four ratings, with identical physical dimensions, are available to cover maximum recurrent peak reverse voltages of 25, 50, 75 and 100 V with a current loading for normal operating temperatures of approximately 10 A. The GR.411 series is suited to all low and medium power applications provided that the maximum operating temperature of 85 deg C is not exceeded. The cell can be supplied mounted on a 4in by 4in fin and arranged to give a variety of half-wave, full-wave and bridge connections for all types of single- or three-phase supplies.



Sylvania-Thorn germanium diode

Immersion Heater

A new automatic immersion heater, the "Barry Automatic," has been introduced by the GRUBB ENGINEERING CO., LTD., Mary Street, Birmingham, 12. It is available in lengths ranging from 11 to 30in, in 2 and 3 kW sizes. The temperature of the water is controlled by a rotating slotted knob fitted in the head of the heater, it not being necessary to remove the head cover when altering the temperature setting. The complete unit, ready to fit, is priced at £2 16s, plus 12s 3d purchase tax, and no additional thermostat is required.

Welding Electrode

The range of welding electrodes manufactured by the METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester, 17, has been increased by the introduction of the "Speedivick 2," a high-grade contact electrode for the downhand welding of steel. The electrode coating has a high iron powder content which, in addition to aiding striking and restriking the arc, is deposited with the core wire, giving a longer welding run for each electrode and a metal recovery of approximately 35 per cent of the core weight. The electrodes are suitable for use with a.c. or d.c. of either polarity, operating satisfactorily with an open circuit voltage of 45 V a.c.

Six sizes are available, ¼in diameter and 4-12 gauge, and the B.S. 1719 classification number for the electrode is E947. Principal applications are

long and short runs of fillet welding, outside corner joints and butt joints including those with deep-groove preparation and high radiographic requirements.

Electric Kettle

A fast boiling electric kettle, the "Hi-Speed," has just been introduced by A.E.I.-HOTPOINT, LTD., 33, Grosvenor Place, London, S.W.1. Its 2 kW "Torribar" sheathed wire element is positioned low enough in the body of the kettle to enable small quantities of water to be boiled, yet with sufficient clearance to avoid undue furring up in hard water districts.

Other interesting points of the kettle include moulded and heat-resisting feet; a large and adequately vented lid which allows easy filling; and a short, easy pouring spout. The moulded handle, available in red or black, is designed for an easy hold, and is secured to the kettle body by means of a robust metal bracket. Protection against damage is provided by a resettable thermostatic safety device incorporated in the element head.

A reversible, double-earthed, two-pin connector and 4ft of three-core flexible are supplied. The kettle has a highly polished chromium plated external finish and is nickel plated

Hotpoint "Hi-Speed" three-pint kettle

internally. Two alternative loadings are available (1½ and 1 kW) and the price is £4 19s 6d including purchase tax.

Image Storing Phosphor

A phosphor for cathode-ray tube screens capable of storing images for periods up to twenty minutes, released by shining infra-red light on the tube face, has been developed by the electronics department of FERRANTI, LTD., Hollinwood, Manchester, Lancs.

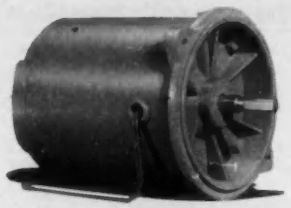
The afterglow of the type "Y" phosphor may be released at any moment by the operator at an intensity ensuring that no persistent image remains when the next field is presented. A variable intensity infra-red light source must be provided arranged for uniform illumination of the whole screen, and this may be obtained by using a viewing hood in which a number of small filament lamps have been mounted. Each lamp is carefully screened by a filter to eliminate as much visible illumination as possible whilst passing the short and medium wavelength infra-red.

Although the mode of action remains the same in each case the components of the phosphor combination deposited on the face of the cathode-ray tube are varied to suit the particular application. Two distinct layers are normally provided, that nearest to the observer being the storage phosphor and the other a "backing layer" capable of converting electron energy into blue, violet or ultra-violet light.

Oil-Burner Flange Motor

Motors of the flange type for use on heating equipment have been added to the "Merlin" f.h.p. range manufactured by BROOK MOTORS, LTD., Empress Works, Huddersfield. Ventilated or totally enclosed fan cooled types are available, complying dimensionally with N.E.M.A. standards, with horse-power ratings for the ventilated type from ⅛ to ¼ single-phase and ¼ to ½ three-phase. Corresponding ratings for the totally enclosed type are 1/12 to ⅛ and ⅛ to ¼.

The standard bearings are sleeve type with a felt packed oil cavity, but ball bearings may be fitted as an extra. A milled flat for fixing a fan or pulley



Brook oil-burner flange motor

is provided on the shaft, which rotates in an anti-clockwise direction, and 20in loose leads are supplied. Thermal cut-out protection, with automatic or manual reset, can be added at an extra charge on single-phase motors.

Street Lighting Units

We have been asked by BARNARD & BUECHELER, LTD., Charters Road, Sunningdale, Berks., to state that the polyester-glass street lighting fittings (*Electrical Review*, 7th November, p. 886) are manufactured by James Whitson & Co., Ltd., exclusively for the B.B. Industries Electrical Group of Barnard & Buecheler, Ltd., who are the sole selling agents.

Toroidal Welding Transformer

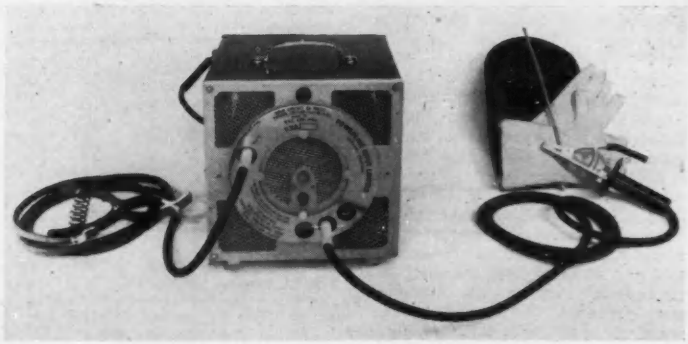
A NEW design of transformer for arc welding is being manufactured by Portable Welders, Ltd., Castle Mills, Buckingham, Bucks. This transformer is based on the toroidal design made by Michael Faraday in 1831.

The "Fararc 200" arc welding transformer weighs only 70 lb and measures 14in cube yet has the power of a conventional arc welding set three or four times its size and weight. The continuous core is made of grain oriented steel and the windings use glass insulated wire, wrapped where necessary in glass woven cloth, the whole being impregnated with silicone varnish and backed. No combustible materials are used and the transformer can operate without damage at up to 180 deg C. It is virtually impossible to destroy it by overheating but, as a final safeguard, a thermostatic switch cuts off the welding current but leaves the cooling fan running.

The power factor is between 0·8 and 0·9 lagging without the use of a correction condenser.

Although the set has an open circuit voltage of only 50 V there is now available a wide selection of electrodes for use at this voltage. The transformer output can be varied between 60 and 230 A with a maximum continuous rating of 200 A. The kVA is 5·2 and there are 36 current settings available. The set is said to cost much less than a conventional arc welding plant of similar size. A further development to be available shortly is a junction box suitable for coupling two or more of the sets together to give outputs of 400, 600 and 800 A.

"Fararc 200" toroidal transformer arc welding set



Financial Section

STOCKS and SHARES

IN the course of another strong advance on a broad front, most of the leading shares in the industrial market of the Stock Exchange have moved up lately to their highest quotations for three years, and need to make only a little more progress to break all previous records. The greater part of the activity has again been attracted to shares of the consumer goods makers and distributors, especially in the fields of domestic and household equipment affected by the removal of hire-purchase controls. Investments in the motor car and associated industries had a fillip also in the excellent annual results published by B.M.C. and S. Smith & Sons, while those in the heavy industries have come more into the picture since the Chancellor's decision to allow increased expenditure by the State undertakings.

Higher Prices

Among "consumer" goods shares, Hoover have again been very prominent, the "A" shares adding a further 3s during the week to previous gains, and reaching 53s 6d. Decca "A" shares were also well to the fore in moving up half-a-crown to 32s 6d. E.M.I., Bulpitts, British Vacuum Cleaner, Ever Ready and Berry's Electric also improved further, while Falk, Stadelmann recovered 3s 9d to 43s 9d. Pifco were outstanding with a rise to 15s 6d after the declaration of the final dividend, which makes a total of 20 per cent and exceeds the estimates. In the cable group, B.I.C.C. led the way with a 2s 6d gain to 51s, and London Electric Wire continued to attract attention. Pyrotenax were bought, the recently introduced new shares going ahead to 34s, which is some 6s 6d above the price at which dealings began last month. Encouraged by good news from the motor industry, Lucas were very firm at 42s 6d (with dealings in the market around 45s) in advance of the dividend declaration.

S. Smith Dividend

Financial results from S. Smith & Sons (England) for the year ended last July were well up to the expectations on the strength of which the 4s shares had been in the ascendant for some weeks previously. They were marked up further from 11s to 12s 3d after the final dividend declaration and the announcement of an improvement by more than a quarter in the net profit to £1·63 million, despite a much larger tax charge. Actually, the dividend for 1957–58 totals 10 per cent, which is equal to last year's, allowing for the intervening scrip issue: the final, however, is accompanied by a special interim dividend of 2½ per cent, on account of the current year, which avoids additional liability to profits tax. For practical purposes the shares are consequently being related in the market to a 12½ per cent annual dividend, on which basis they show a yield of a fraction over 4 per cent. From the preliminary figures, it appears that the amount of the distribution is again

Price Changes in

Company or Board	Nom. Value	Middle price 10th Nov.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Gilt-edged Stocks								
Brit. Elec. 1968/73	100	76½		3	3	3 18 6	76½	72
Brit. Elec. 1974/77	100	73½		3	3	4 1 9	73½	68½
Brit. Elec. 1976/79	100	77	−½	3½	3½	4 11 0	78½	72
Brit. Elec. 1974/79	100	87		4½	4½	4 17 9	87½	82½
Overseas Electric Supply								
Calcutta Elec.	£1	17/-	+6d	6·8†	7†	8 4 3†	17/6	15/-
East African Power	£1	22/9	−3d	7½	8	7 0 3	23/-	17/6
Nigerian Elec.	£1	14/6		10	10	13 16 0	17/-	12/6
Perak Hydro-Elec.	£1	14/-		12½	10	14 5 9	15/6	13/6
Electrical Shares								
Aberdare Holdings	5/-	13/6		17½	17½	6 9 9	13/9	9/9
Aerialite	1/-	8/-	−6d	51½	54	6 15 0	8/6	5/1
Allen, W. H.	£1	43/9		10	11	5 0 6	43/9	32/9
Anglo-Portuguese Tel.	£1	26/3	−1/3	8	8	6 17 3	29/3	19/9
Aron Elec. Ord.	£1	61/3	+1/3	15	15	4 18 0	61/3	53/-
Assoc. Elec. Ord.	£1	56/3	+1/3	15	15	5 6 9	56/3	46/6
Automatic Tel. & El.	£1	72/6		17	17	4 13 9	72/6	57/-
Babcock & Wilcox	£1	53/9	+1/3	15	13‡	4 16 9	54/6	41/9
Bakelite	10/-	22/6	−6d	15	15	6 13 3	23/-	17/6
Baldwin, H. J.	2/-	3/-		20	20	—	3/9	2/6
Berry's Electric	5/-	10/6	+1/3	10	10	4 15 3	10/6	5/9
British Aluminium	£1	58/6	+4/-	12	12	4 2 0	58/6	37/-
Brit. Elec. Traction: Def. Ord. "A"	5/-	38/-	+6d	25	25	3 5 9	40/-	19/6
B.I. Callender's	£1	51/-	+2/6	12½	12½	4 18 0	51/-	38/9
B.I. Callender's 6% Pref.	£1	20/-		6	6	6 0 0	20/3	19/-
British Tabulating	£1	56/3	+1/3	9	10	3 11 0	57/6	38/6
British Thermostat	5/-	34/9		25	30	4 6 3	35/3	19/9
British Vac. Cleaner	5/-	4/6	+3d	10	10	5 11 0*	4/6	2/3
Brook Motors	10/-	43/9x.c.	+2/6	25	25	—	43/9	27/9
Bulgin, A. F.	1/-	7/-		40	45	6 8 6	7/-	4/7
Bulpitts	5/-	10/-	+6d	—	12½‡	6 5 0	10/-	7/3
Burco Dean	5/-	10/9		20	22½	6 19 6*	10/9	7/9
Cable & Wireless: Ord.	5/-	13/-	+3d	10	10‡*	3 17 0	13/-	8/-
4% Loan	100	94		4	4	4 4 0	94½	89
Chloride El. Storage "A"	£1	65/-		17½	17½	5 7 9	66/3	55/6
Clarke Chapman	£1	64/3		27½	27½	4 5 6*	72/6	55/-
Cole, E. K.	5/-	17/6	+3d	17½	17½	5 0 0	18/-	15/3
Cossor, A. C.	5/-	5/3		2½	Nil	Nil	6/-	4/4
Crabtree	10/-	32/-		20	20	6 5 0	32/-	24/4
Crompton Parkinson	5/-	12/6		16	12*	4 16 0	13/6	8/3
De La Rue	10/-	31/-	+9d	35	17½*	5 13 0	31/-	20/9
Decca "A"	4/-	32/6	+2/6	43½	43½	5 7 9	32/6	21/3
Desoutter	5/-	16/6		32½	18‡*	5 13 9	16/6	13/6
Dewhurst	2/-	8/9		16½	20	4 11 6	9/-	6/9
Dictograph Tel.	2/-	7/3		20	20	5 10 3	7/3	4/7
Dubilier Condenser	1/-	3/6		30	20*	5 14 3	4/3	3/1
Duport	5/-	10/9		25	25	5 16 3*	10/9	7/9
E.M.I.	10/-	54/-	+1/-	15	15	—	54/-	27/6
Electrical Components	5/-	9/3	+3d	12½	12½	6 15 3	9/9	7/-
Elec. Construction	£1	28/9		8½	8½	5 18 3	28/9	21/-
Elliott-Automation	5/-	19/6	+6d	—	10‡	2 11 3	19/9	11/6
Enfield Cable Ord.	£1	17/-		Nil	2½	2 18 9	18/9	10/9
English Electric	£1	57/6		14	14	4 17 3	60/-	44/-
English Electric 3½% Pref.	£1	12/6		3½	3½	6 0 0	12/6	11/9
Ericsson Tel.	5/-	24/9		22†	12*†	4 4 0	25/3	17/6
Ever Ready	5/-	22/-	+1/3	37½	20*	4 11 0	22/-	13/9
Falk Stadelmann	£1	43/9	+3/9	17½	15	6 17 3	46/3	35/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

very well within the surplus available for dividends and reserves.

K.G. (Holdings)

Financial results for 1957–58 published by K.G. (Holdings), whose annual meeting has just been held, showed a continuance of the progress made each year since the company assumed its present character by the acquisition, in 1954, of the F. H. Wheeler group of electrical and mechanical engineers. Subsequent acquisitions have included the businesses of W.S. Electronics, Telux, Perihel, Bonochord and others. The latest net profit of £189,000 was a record despite a loss suffered by one subsidiary, which was said in the report to have been restored since to profit-making. In addition to a well covered 30 per cent dividend on the £232,300 ordinary capital, the company proposes to distribute a scrip issue in the form of one 7½ per cent preference share for every fifty of the 1s ordinary shares, which have been quoted lately at 3s.

Electrical Investments

Company or Board	Nom. Value	Middle price 10th Nov.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1958 Highest	1958 Lowest
Electrical Shares—continued								
G.E.C. Ord.	£1	38/3	+9d	12½	10	5 4 6	40/-	29/3
G.E.C. 6½% Pref.	£1	21/6		6½	6½	6 1 0	21/6	20/3
General Cables	5/-	10/3	+6d	30	24	—	11/9	8/3
Greenwood & Batley	£1	52/6		17½	20	7 12 6	52/6	45/-
Hackbridge Holdings	5/-	14/3		20	20	7 0 3	14/9	7/6
Hackbridge & Hewittic	5/-	14/-	−6d	20	20	7 2 9	14/6	9/7
Head Wrightson	5/-	24/6	−1/6	22½	17½*	3 11 6	26/-	16/9
Heatrae	2/-	7/3		15	20	5 10 3	7/3	4/-
Henley's	10/-	20/6	+6d	11½	11½	5 12 3	20/6	10/6
Holophane	5/-	15/-		37½	22½*	7 10 0	15/3	12/6
Hoover	5/-	53/6	+3/-	50	50	4 13 6	53/6	31/-
I.C.I.	£1	35/6	−6d	10	12	4 10 3*	36/-	23/9
Intl. Combustion	5/-	28/3	+9d	22½	25	4 8 6	28/3	19/3
Johnson & Phillips	£1	20/-	−6d	10	5	5 0 0	25/-	15/-
Lancashire Dynamo	£1	40/-		11	11	5 10 0	40/-	28/6
Laurence Scott	5/-	16/9		15	15	4 9 6	16/9	12/6
Lister, R. A.	£1	31/6		10	10	6 7 0	31/6	23/-
London Elec. Wire	£1	63/9		12½	12½	3 18 6	64/6	39/6
Lucas, J.	£1	42/6	+9d	7½	7½	3 10 6	42/6	27/9
Marconi Marine	£1	37/6	+1/3	10	10	5 6 9	37/6	29/-
Marryat & Scott	2/-	7/6		35	37½	5 0 0*	7/7	5/3
Mather & Platt	£1	50/-	+1/3	15	15	4 0 0*	50/-	29/6
Metal Industries	£1	43/6		9	14	6 8 6	44/-	22/9
Midland Elec. Mfg.	£1	60/-		12½	12½	—	60/-	44/-
Morphy-Richards	4/-	18/9		20	20	4 5 3	19/-	14/6
Murex	£1	53/9	−6d	20	17½	6 10 3	59/3	48/-
Newman Ind.	2/-	2/9		10	10	7 5 6	2/9	2/3
Oldham & Son	1/-	3/-		17½	17½	5 16 9	3/-	2/3
Parsons, C. A.	£1	55/-	+2/6	8½	7½*	2 14 6	55/-	43/-
Plessey	10/-	70/-		30	30	4 5 9	72/6	55/-
Pye	5/-	17/-		12½	12½	3 13 6	17/-	10/-
Pyrotenax	5/-	31/3	+1/9	—	27½‡	4 8 0	31/3	27/6
Reyrolle	£1	88/9		17½	17½	3 19 0	88/9	73/6
Rheostatic	4/-	7/6		12½	12½	6 13 3	8/-	6/-
Richardsons Westgarth	10/-	15/3		16⅔	8½*	5 9 3	15/9	13/-
Scottish Cables	4/-	11/9		27½	27½	5 8 9*	11/9	7/-
Simon-Carves	5/-	30/-	+1/3	20	25	4 3 3	30/-	22/6
Smith (England), S.	4/-	12/3	+1/3	20	12½*‡	4 1 9	12/3	7/-
Southern Areas	£1	12/6	+1/6	7½	Nil	Nil	13/9	9/3
Strand Elec.	5/-	8/9		15	15	8 11 6	8/9	4/9
Sturtevant	5/-	19/6	+1/9	15†	15†	6 14 0	19/6	14/9
Sun Elec.	£1	60/-		25	25	8 6 9	60/-	47/3
Switchgear & Cowans	5/-	8/9	+3d	25	22½	6 8 6*	8/9	4/6
Taylor Tunnicliff	5/-	17/3		15	17½	5 1 6	17/3	11/9
T.C.C.	10/-	37/6		25	25	6 13 3	38/6	32/6
T.C. & M.	£1	28/9		8½	8½‡	5 18 3	30/-	20/-
Telephone Mfg.	5/-	5/6		10	10	9 1 9	5/9	4/6
Telephone Rentals	5/-	12/6	+3d	12½	12½	5 0 0	13/6	9/9
Thompson (John)	5/-	26/-		25	25	4 16 3	27/-	23/-
Thorn Elec. "A"	5/-	23/-	+6d	17½	17½	3 16 0	23/3	17/-
Thornycroft	£1	23/9	−1/3	12½	7½	6 6 3	30/9	21/-
Tube Investments	£1	74/6	+9d	15	17½	4 14 0	74/6	48/3
Vactric	5/-	33/9		25	25	—	33/9	14/3
Veritys	5/-	5/3		12½	2½	2 7 6	6/9	5/3
Walsall Conduits	4/-	17/3		20	22½	5 4 3	17/3	11/-
Ward & Goldstone	5/-	33/-		40	25*	3 15 9	33/6	23/6
Watford	2/-	7/6	+3d	25	25	5 6 9*	7/6	4/-
Westinghouse	£1	43/9	+2/-	18	10*	4 11 6	43/9	32/3
West, Allen	5/-	12/3	+6d	15	12½*	—	12/3	7/9
Wolf Electric	5/-	8/3	−3d	20	10*	6 1 3	9/-	6/9

Aerialite and Crabtree

With the trading profit for the twelve months ended last May a little higher, at £396,000, Aerialite are raising their final dividend to make a total of 54 per cent for the year, against the 51½ per cent payment for 1956–57. After the announcement the 1s shares were quoted a few pence below their recent best at 8s, and show a yield of 6¾ per cent on the new rate. The statement added the information that the company's interest in T.W.W. is 3 per cent of the equity. Crabtree Electrical Industries £1 shares were uncertain following news of the 21 per cent contraction in profits for the year to July last. The return on the shares at 32s is 6½ per cent on the 20 per cent dividend, for the fifth successive year.

Engineering Shares

A stronger demand for investments in the big electrical groups and heavy engineering shares was reflected in improvements in A.E.I., G.E.C., and C. A. Parsons. Simon-Carves were 1s 3d better at 30s. International Combustion rose to 28s 3d, Babcock and Wilcox to 53s 9d and Tube Investments to 74s 6d. Allen West and Switchgear & Cowans both went higher in their "ex-capitalisation" form, and a number of other electrical shares reflected the confident state of this market. Brook Motors were quoted ex-the one-for-five scrip issue and were marked up by the equivalent of 2s 6d to 43s 9d.

Kango Electric Hammers

Next Wednesday (19th November) is the last day for the renunciation of allotment letters issued on the recent marketing of Kango Electric Hammers 4s ordinary shares, after which transfers will be subject to the usual 2 per cent stamp duty. Quoted lately at around 5s 3d, the shares offer a yield of 9½ per cent on the basis of the 12½ per cent total dividend which the directors expect to distribute for the present year. (An interim of 5 per cent has already been paid). The company's earnings record shows a steady rise in recent years to a trading profit of £91,100 in 1957. On the company's estimate of not less than £84,500 for the current year, the indicated rate of dividend would be covered more than twice by the net surplus after all charges.

REPORTS and DIVIDENDS

S. Smith & Sons (England), Ltd., reports a group profit for the year to 2nd August last of £3,382,306, as compared with £2,847,193 for the preceding year. Taxation absorbs £1,751,160, and the net profit is £1,631,146 (against £1,277,616). After deducting minority interests of £28,045, the balance available is £1,603,101. It is proposed to pay a final dividend of 6½ per cent, making 10 per cent for the year on doubled capital, and also to pay a special interim dividend of 2½ per cent. For the previous year the total distribution on the smaller capital was 20 per cent.

Aerialite, Ltd., reports group profits for the year ended 31st May last of £396,125, as compared with £390,073 for 1956-57. It is proposed to pay a final dividend of 34 per cent (against 32½ per cent), making 54 per cent (51½ per cent) for the year.

Crabtree Electrical Industries, Ltd.—The consolidated trading profits and other receipts for the year to 31st July last amount to £343,091, as compared with £433,457 for the previous year, and after meeting all charges, including £166,354 for taxation, the net balance is £112,572 (against £150,950). The dividend for the year is maintained at 20 per cent with a final payment of 12½ per cent.

The Heenan Group, Ltd.—The group profits for the year to 30th August last amount to £419,481, as compared with £496,062 for the preceding year, and after providing £250,167 for taxation, the net profit is £169,314 (against £221,845). General reserve receives £100,000, and the final dividend proposed is 7½ per cent, again making 10 per cent for the year. The balance carried forward is £71,876 (against £72,831 brought in).

Dictograph Telephones, Ltd., reports that after providing £117,426 for taxation, the net profit for the year ended 31st August last is £96,677, as compared with £95,453 for 1956-57. The dividend for the year is maintained at 20 per cent with a final payment of 10 per cent. General reserve receives £50,000 and £47,726 is carried forward (against £51,364 brought in).

Relay Exchanges, Ltd.—At an extraordinary meeting held on 6th November, resolutions were passed increasing the authorised capital to £2,250,000 by the creation of an additional 5 million ordinary shares of 5s each, and for the capitalisation of £873,497 10s to be applied in paying up in full one ordinary share of 5s for each ordinary share held.

In submitting the resolutions, Sir Walter J. Womersley, Bt. (chairman), said that the main reason for the increase in the authorised capital, over and above the amount immediately necessary to carry through the capitalisation, was that the company would be in a position to acquire other businesses when opportunity arose. The board was already in the early stages of negotiations for acquiring two concerns.

Pifco Holdings, Ltd., reports a consolidated profit for the year ended 30th April last of £197,779, as compared with £196,011 for the preceding year. Taxation absorbs £95,325 and it is proposed to pay a final dividend of 12½ per cent, making 20 per cent for the year.

Wilkins & Mitchell, Ltd.—It is reported that over £7·75 million was offered for the issue of 1,062,696 ordinary 5s shares at 8s each made on Thursday last week. Applications from employees up to 250 shares were accepted in full, larger applications receiving reduced allotments on a sliding scale. Other applications were balloted, the maximum allotment being 100 shares.

Simon-Carves–Lodge-Cottrell.—The offer by Simon-Carves, Ltd., to acquire the whole of the issued capital of Lodge-Cottrell, Ltd., has now been accepted by the holders of more than 90 per cent thereof and has accordingly become unconditional.

The Anglo-Portuguese Telephone Co., Ltd., is to raise £1,200,000 by an issue to stockholders. It is proposed to offer to ordinary and "A" ordinary stockholders 982,000 £1 ordinary shares at 24s each in the proportion of one for five. Stockholders may also apply for a further 18,000 shares at the same price and applications for excess shares are invited. The new shares will rank for any final dividend declared for 1958.

A.E.I.–Henley's.—Associated Electrical Industries, Ltd., announces that holders of over 90 per cent of the preference and ordinary stock of W. T. Henley's Telegraph Works Co., Ltd., have accepted the A.E.I. offer for their holdings. Subject to permission to deal in the allotted A.E.I. shares the offer becomes unconditional. Allotment letters are to be posted to Henley shareholders to-morrow (Saturday).

Keith Blackman, Ltd., proposes to make a free scrip issue of one 7 per cent cumulative £1 second preference share for every four 10s ordinary shares held.

The East African Power & Lighting Co., Ltd., has declared an interim dividend of 3 per cent (unchanged).

G. & J. Weir, Ltd., are paying an interim dividend of 4 per cent (against 3¾ per cent).

Rediffusion, Ltd., has announced an interim dividend of 6 per cent, tax free (against 5 per cent), on larger capital.

New Companies

Peto Scott Electrical Instruments, Ltd.—Registered 30th October. Capital £100,000. Manufacturers of and dealers in television, radio, gramophone, recording, musical sound producing and reproducing and electrical apparatus, etc. Solicitors: Campbell Hooper & Todd and Fournier & Roberts, 15, Jermyn Street, S.W.1.

Queens Radio & Electrical Co., Ltd.—Registered 8th October. Capital £2,000. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Directors: H. Clipp, Mary Clipp and Rose Clipp. Regd. office: 391, Honeypot Lane, Stanmore, Middx.

John F. Carson & Son, Ltd.—Registered 6th October in Edinburgh. Capital £500. Electrical contractors, electrical, mechanical, radio and television engineers, etc. Directors: J. F. Carson and R. A. Carson. Regd. office: 130, West Blackhall Street, Greenock.

Sionic, Ltd.—Registered 9th October. Capital £500. Electrical engineers and contractors, electricians, electronic engineers and television and radio engineers, etc. Directors: L. W. Boucher and Betty G. Linger. Regd. office: 303, Chiswick High Road, W.4.

Capacitors, Ltd.—Registered 13th October. Capital £50,000. Manufacturers of and dealers in electrical capacitors, resistors, potentiometers, etc. Regd. office: 222, Soho Hill, Handsworth, Birmingham.

Royal Worcester Industrial Ceramics, Ltd.—Registered 14th October. Capital £100. Manufacturers of and dealers in high temperature oxide ceramics for electronic, industrial and engineering use, etc. Solicitors: Linklaters and Paines, 59/67, Gresham Street, E.C.2.

Howells & Shepperson, Ltd.—Registered 15th October. Capital £2,000. Designers, manufacturers, hirers, repairers and distributors of, agents for and dealers in radio, television, electrical, electronic and telephone apparatus and supplies, etc. Directors: R. S. Howells, A. H. Shepperson and Mrs. Betty Howells. Regd. office: 27, Landseer Road, Southwell, Notts.

Hilderthorpe Electrical Supplies, Ltd.—Registered 15th October. Capital £1,000. Manufacturers of and wholesale and retail dealers in and agents for manufacturers of domestic, household and general electrical and other equipment and appliances, etc. Directors: Mrs. Ethel R. Haddock, J. E. Brooke and R. Gough. Regd. office: 18, Hilderthorpe Road, Bridlington, Yorks.

K. & H. Electrics, Ltd.—Registered 16th October. Capital £1,000. Manufacturers of and dealers in electrical goods, apparatus, appliances and accessories, etc. Directors: F. Hayes and P. J. Kearney. Regd. office: 550, Fulham Road, Fulham, S.W.

H. G. Curgenven, Ltd.—Registered 24th October. Capital £3,000. Manufacturers of and dealers in radio, television and electrical apparatus, etc. Directors: H. G. Curgenven and P. G. Curgenven. Regd. office: 41, Bampton Street, Tiverton, Devon.

South Western Electrics (Hereford), Ltd.—Registered 24th October. Capital £500. Directors: B. R. Maughfling (managing director), J. D. Matthews and W. F. Freeman. Regd. office: 34, Castle Street, Hereford.

Bankruptcies

J. E. Woodcock, lately carrying on business at 85, Pershore Road South, King's Norton, Birmingham, under the style of Industrial Maintenance and Power Service, electrical contractor.—Public examination 7th January at the Court House, Corporation Street, Birmingham, 4.

L. J. Wotton, 76, Babbacombe Road, Torquay, radio and electrical engineer.—Trustee, Mr. J. E. Ellis, 50, The Terrace, Torquay, appointed 28th October.

G. W. Gould, formerly carrying on business at Hillington, Norfolk, as an electrical contractor.—Trustee, Mr. C. A. Taylor, 41, Sidney Street, Cambridge, Official Receiver, released 28th October.

G. Moore, lately trading as the Electric Meter Co., at 123, Hele Road, Torquay, and 2, Barnhill Road, Torquay, electrical engineer.—First and final dividend of 3s 2¾d in the £, payable on and after 18th November, at 50, The Terrace, Torquay.

GENERATION and DEVELOPMENT

Bulk Supply Tariff

The Central Electricity Generating Board has announced revisions of its bulk supply tariff for the Area Boards to operate in the year beginning next April. The maximum demand charge is to be raised from £6 to £7 2s per kW while the running charge will fall from 0·46d to 0·41d per kWh. At the same time the fuel-cost adjustment is to be reduced from 0·0006d to 0·00055d per kWh for each penny by which the cost of coal rises above or falls below 60s/ton. The last-named reduction takes account of the high efficiency of the modern stations which carry a large part of the load.

North-East Supergrid Route

Durham County Council has generally approved the route of a proposed 275 kV overhead line to be erected by the Central Electricity Generating Board between Blyth and the south Tees-side area. The new line will feed substations at Lackenby (to serve the North Riding of Yorkshire), Boldon (to serve North Durham), Hart Moor (to serve the Hartlepools area) and Norton (to supply the west of the county).

The County Planning Committee, in a report to the County Council, said it was felt that the general route of the proposed line must be accepted in view of the need to link up with transformer stations in certain places. Reference was made, however, to a meeting of local authorities at South Shields when it was suggested that underground cables should be used in built-up areas or areas scheduled for development. The Committee said that minor variations of the route might reduce the impact on the landscape. It has appointed a small sub-committee to discuss possible variations with the Board.

Area Boards' Domestic Appliance Sales

Large increases in sales of new electrical appliances by Area Boards in England and Wales are shown in the latest return issued by the Electricity Council. The number of cookers sold in September, for example, was 22,922 against 6,831 in August and washing machine sales numbered 8,265 against 6,831. For seasonal reasons there was a small decrease in sales of refrigerators but the September total of 6,037 compares with only 3,157 in the corresponding month of 1957.

In considering the figures in the accompanying table it should be borne in mind that Area Boards' sales represent only a part of the total for the country.

Lanarkshire Supply Reinforcement

The South of Scotland Electricity Board has approved a scheme, estimated to cost £149,900, for the reinforcement of the electricity supplies in part of the Lanarkshire Area including Millerston and Kirkintilloch. At present the 11 kV network supplying this area is fed from Millerston substation. The Kirkintilloch load will be transferred to a new 33/11 kV substation and consequential alterations made in the network. The work will be completed by 1960.

Municipal Trading Opposed

Pershore Rural District Council recently rejected a proposal to supply Council tenants with refrigerators for 3s a week. Mr. D. W. Heath suggested that the Council would be becoming a trading department at the expense of the ratepayers. "You start with refrigerators but you must go on to television sets, washing machines, wireless sets, prams and furniture," he said.

Inquiry into Dungeness Nuclear Power Project

The Minister of Power has decided to hold a public inquiry into the proposal by the Central Electricity Generating Board to build a nuclear power station at Dungeness in Kent. The inquiry will be opened at the War Memorial Hall, Station Road, Lydd, at 10.30 a.m. on Tuesday, 16th December. It will also deal with objections which have been received to transmission lines proposed to run from Dungeness to a substation at Lydd, and with objections to a compulsory purchase order which has been made in connection with the projected power station. The Minister has appointed Mr. H. W. Grimmitt, C.B.E., M.I.E.E., A.M.I.Mech.E., chief engineering inspector of the Ministry of Power, and Mr. W. A. Devereux, F.R.I.B.A., A.A.Dip., senior planning inspector, Ministry of Housing and Local Government, to hold the inquiry.

Dust Problem

Newcastle-on-Tyne City Health Committee has discussed with representatives of the Ministry of Power and the Ministry of Housing and Local Government the problem of dust which settles on property in the west end of the city. The City Council has been in touch with the Central Electricity Generating Board for some time about the amount of dust emitted from the Dunston and Stella power plants, which it contended was due to the Board using an inferior type of coal. It has now been stated that only 20 per cent of the dust falling on the area concerned is actually from the power stations, the rest coming from domestic and industrial chimneys. The Health Committee is to make representations to the Generating Board to reduce the 20 per cent emission of dust.

OVERSEAS

New Shawinigan Station

The Shawinigan Water & Power Company's new Beaumont hydro-electric generating station was recently inaugurated by the Premier of Quebec, the Hon. Maurice Duplessis. The new plant, Shawinigan's seventh development on the St. Maurice River, is approximately ten miles north of La Tuque. When all six of Beaumont's generating sets are in operation next year, the plant will have an installed capacity of 246 MW, increasing the total capacity of the Shawinigan system to more than 1,500 MW.

Uganda Supply Extension

The Uganda Electricity Board has recently switched on a supply over a new 11 kV line from Bbowa to Nakaseke, in Buganda. This completes the main high voltage system for the section of the Board's Central Mengo scheme to the north of Bombo and Kampala.

Brazil and Nuclear Power

The "Fortnightly Review" of the Bank of London and South America reports that President Kubitschek of Brazil is showing a deep interest in a proposal from Mitchell Engineering, Ltd., to build a nuclear station in Brazilia, the new Federal capital. It is stated that the hydro-electric plant which is being constructed to supply the city will not be ready in 1960 when the capital is to be inaugurated. A 20 MW nuclear station could, however, be in operation by that time and if it were no longer required in Brazilia could be transferred elsewhere.

AREA BOARDS' SALES OF APPLIANCES

Type of Appliance	Sales in Month ended 30th September, 1958		Sales in 12 Months ended 30th September	
	Total	% change over corresponding period of previous year	Total	% change over corresponding period of previous year
Cookers	22,922	+ 16·6	230,907	+ 1·9
Water Heaters—				
Immersion	14,626	+ 29·2	157,446	+ 12·6
Storage	4,132	+ 16·2	44,953	+ 8·0
Wash Boilers	7,390	+ 2·3	79,701	+ 1·8
Washing Machines	8,265	+ 22·0	76,673	+ 5·6
Refrigerators	6,037	+ 90·9	62,436	+ 29·2

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1954

8445. Rank Cintel, Ltd.—Electronic discharge lamps. 22nd March, 1955. (804342.)

9634. New Day Electric, Ltd.—Electric plug connectors. 1st April, 1955. (804251.)

16621. Siemens Edison Swan, Ltd.—Electronic flash-discharge tubes. 6th June, 1955. (804319.)

24561. Miller & Co., Ltd., H.—Dynamos. 24th August, 1955. (804422.)

34773. Westinghouse Brake & Signal Co., Ltd., and Watson, T. F. E.—Metal rectifier assemblies. 15th November, 1955. (804171.)

37867. Sperry Rand Corporation.—Microwave transmission systems. 31st December, 1954. (804200.)

1955

4201. Vadasz, S. J.—Electric grills. 9th May, 1956. (804367.)

6620. Minneapolis-Honeywell Regulator Co.—Electrical measuring instruments. 7th March, 1955. (804435.)

8353. Elliott Bros. (London), Ltd.—Electromagnetic relays. 20th June, 1956. (804370.)

13803. Varian Associates.—Travelling wave electron discharge devices. 12th May, 1955. (804437.)

16035. General Electric Co.—Methods of assembly of electron-discharge devices. 3rd June, 1955. (804423.)

16925. Igranic Electric Co., Ltd.—Control of electromagnets. 13th June, 1955. (804351.)

18351. General Electric Co., Ltd.—Electric relay arrangements. 19th June, 1956. (804302.)

26617. Collins Radio Co.—Synchronous rectifier and phase detector. 16th September, 1955. (804425.)

1956

2186. British Thomson-Houston Co., Ltd.—Detection of surface cracks in electrically conducting materials. 23rd January, 1957. (804323.)

5048. Soc. Industrielle de Liaisons Electriques and Hours, G. E.—Magnetic signalling systems for railways. 17th February, 1956. (804427.)

5380. Bendix Aviation Corporation.—Electrical control system. 21st February, 1956. (804385.)

6163. Square D Co.—Control of dynamo-electric machines. 28th February, 1956. (804361.)

9423. General Electric Co., Ltd.—Manufacture of semiconductor devices. 26th March, 1957. (804166.)

10310. Siemens-Schuckertwerke A.G.—Electric switches. 4th April, 1956. (804388.)

10838. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 8th March, 1957. (804146.)

11515. Goodmans Industries, Ltd.—Weatherproofing of electrical apparatus. 12th March, 1957. (804215.)

13984. Davies, D. H., and Williams, W.—Terminal fittings for electric firebars. 19th June, 1956. (804389.)

14386. Rank Cintel, Ltd.—Gas discharge lamp apparatus. 22nd March, 1955. (Divided out of 804342.) (804343.)

17186. Philips Electrical Industries, Ltd.—Radio receivers. 4th June, 1956. (804393.)

17202. Federal Pacific Electric Co.—Automatic circuit-breakers. 4th June, 1956. (804428.)

19523. United Kingdom Atomic Energy Authority.—Nuclear reactors. 24th May, 1957. (804395.)

20601. Dishmaster Appliances, Ltd.—Washing machines. 3rd July, 1956. (804397.)

22993. English Electric Valve Co., Ltd.—Magnet and holder assemblies for magnetron tubes. 5th February, 1957. (804429.)

23987. Standard Telephones & Cables, Ltd.—Manufacture of electric circuits. 3rd August, 1956. (804189.)

26574. Allis-Chalmers Manufacturing Co.—Gas-blast circuit-breakers. 30th August, 1956. (804401.)

28662. McGraw Electric Co.—Magnetic core and its method of construction. 19th September, 1956. (804169.)

29591. Standard Telephones & Cables, Ltd.—Contact spring pile-ups. 28th September, 1956. (804295.)

30245. Allmänna Svenska Elektriska A.B.—Elevator control system. 4th October, 1956. (804191.)

30752. Yoshida, K.—Titanium oxide rectifiers and the manufacture thereof. 9th October, 1956. (804405.)

35796. Allis-Chalmers Manufacturing Co.—Dynamo-electric machine rotor. 22nd November, 1956. (804409.)

37171. Communications Patents, Ltd.—Automatic electric circuit keying apparatus. 5th December, 1956. (804218.)

38557. Standard Telephones & Cables, Ltd.—Telegraph frequency modulators. 18th December, 1956. (804411.)

38673. Westinghouse Electric International Co.—Methods of manufacturing wound type cores for inductive apparatus. 19th December, 1956. (804412.)

1957

924. Soc. Alsacienne de Constructions Mecaniques.—Telecommunication cables and processes and apparatus for manufacturing such cables. 9th January, 1957. (804298.)

4221. Bristol Co.—Tubular shields for electric circuit components, particularly screening cans for electromagnetic switching devices. 7th February, 1957. (804414.)

6049. Standard Telephones & Cables, Ltd.—Two-way transistor electrical transmission system. 22nd February, 1957. (804415.)

9742. Siemens-Schuckertwerke A.G.—Electric motor driving means for vehicles. 25th March, 1957. (804418.)

14173. Osnabrücker Kupfer- und Drahtwerk.—Suspension type electric transmission cables. 3rd May, 1957. (804310.)

14442. Albert, O. R.—Steering wheel electric switch. 7th May, 1957. (804277.)

22798. Hobart Manufacturing Co.—Dishwashing machine. 18th July, 1957. (804239.)

24126. Brown, Boveri & Cie. A.G.—Cooling means for semi-conductor elements. 30th July, 1957. (804297.)

32185. Square D Co.—Control of dynamo-electric machines. 28th February, 1956. (Divided out of 804361.) (804362.)

CATALOGUES AND LISTS

BEARINGS.—Illustrated 24-page catalogue giving particulars of "Max-Load" high capacity roller bearings.—**Pollard Bearings, Ltd.**, Ferrybridge, Knottingley, Yorkshire.

CONDUIT FITTINGS.—Leaflet describing the company's anti-vibration units for the protection of lighting fittings.—**Kenwell Electric, Ltd.**, Meanwood Works, Spotland Bridge, Rochdale, Lancs.

FURNACES.—Leaflet giving particulars and illustrations of a new range of electric muffle furnaces for laboratory and workshop use.—**A.E.W., Ltd.**, Imperial Works, High Street, Edgware, Middlesex.

HEALTH LAMPS.—Illustrated catalogue covering the company's range of infra-red, carbon-arc sunlamps and mercury quartz ultra-violet lamps.—**Pifco, Ltd.**, Watling Street, Manchester.

LAMPS.—Illustrated folder giving particulars of the new "Osram" 5ft 80 W universal-start tube.—**General Electric Co., Ltd.**, Magnet House, Kingsway, London, W.C.2.

Leaflet describing the recently introduced Mazda "Netabulb" 100 W lamp.—**A.E.I. Lamp & Lighting Co., Ltd.**, Melton Road, Leicester.

LIGHTING FITTINGS. — Illustrated leaflet dealing with the "Artlite" range of decorative wall lights.—**Gateware Products, Ltd.**, Sefton Street, Hollinwood, Oldham, Lancs.

Leaflet illustrating various Walt Disney table lamps now being produced by the company.—**Carimex, Ltd.**, 69, Upper Street, London, N.1.

Illustrated and priced 40-page catalogue (L.F.59) covering industrial lighting fittings.—**Walsall Conduits, Ltd.**, Excelsior Works, West Bromwich.

LOW VOLTAGE EQUIPMENT.—Folder containing leaflets illustrating and describing the company's range of low voltage power supply units and accessories for use in school science laboratories.—**Electro Apparatus (London), Ltd.**, Bentfield End, Stansted, Essex.

LUBRICANTS.—34-page catalogue dealing with molybdenised lubricants and giving examples of many industrial uses of these lubricants, including applications in the electrical and electronic fields.—**Rocol, Ltd.**, Rocol House, Swillington, nr. Leeds.

UNDERFLOOR DUCT.—Illustrated 32-page catalogue (U.D.58) giving particulars and prices of the company's underfloor duct network system.—**Walsall Conduits, Ltd.**, Excelsior Works, West Bromwich.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 22nd November:—

LYNX. No. 772,704. Class 7. Electrically and gas operated machines for use in the welding, cutting, brazing and like heat treatment of metals.—Quasi-Arc, Ltd., Bridgewater House, Cleveland Row, St. James's, London, S.W.1.

HOOVER. No. B778,439. Class 7. Drying machines.—Hoover, Ltd., Perivale, Greenford, Mdx.

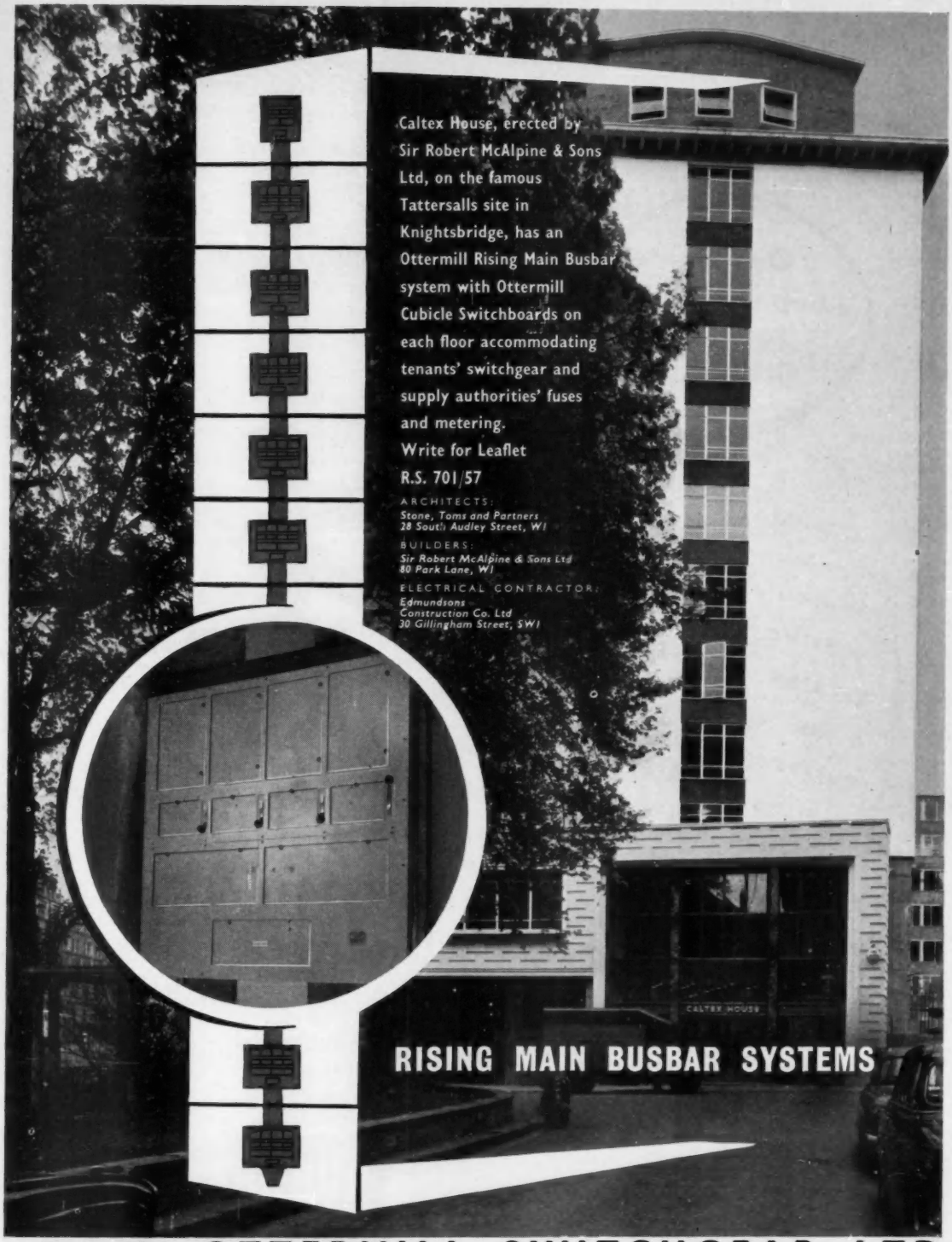
FIGARO. No. 779,039. Class 8. All goods included in Class 8.—Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London, N.7.

MERPLEX. No. 769,126. Class 9. Cables, filaments, insulated wires, tapes and rods, all being electricity conductors.—Mersey Cable Works, Ltd., Linacre Lane, Bootle.

TELEBLOC. No. 770,099. Class 9. Electric relays and current transformers for telecommunication purposes; prepayment mechanisms (parts of telephone installations); and electro-mechanical vending machines.—R. P. Zogmal, Nyon, Switzerland. Address for service, c/o Eric Potter and Clarkson, 14, Oxford Street, Nottingham.

MICROSIL. No. 771,272. Class 9. Scientific and electrical apparatus and instruments, etc.—James A. Jobling & Co., Ltd., Wear Glass Works, Alfred Street, Millfield, Sunderland.

INFRASOL. No. 777,043. Class 11. Electric infra-red ray heating appliances (not for surgical or curative purposes).—Grimwood (Croydon), Ltd., 59-65, Cross Road, East Croydon.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BURDETTE'S
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NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 17th November

BIRMINGHAM.—Grand Hotel. Birmingham Electric Club. "Fabrication of Copper for Electrical Purposes," by Dr. R. D. Carter.

BRIGG.—Angel Hotel, 6.45 p.m. I.E.E. Sheffield Sub-Centre. "The Generation of Electricity in the London Area," by H. V. Pugh.

BRISTOL.—Lecture Theatre, South Western Electricity Board, 7 p.m. I.E.S. Bath and Bristol Centre. "The Stage and Lighting Engineer," by F. P. Bentham.

CAMBRIDGE.—Technical College, 6.30 p.m. I.E.E. East Anglian Sub-Centre and Institution of Mechanical Engineers, Eastern Branch. "The Zeta Reactor," by R. Carruthers.

CARDIFF.—At the South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre Supply Group. "Operation of Power Stations," by R. S. Atkinson, and "Power Station Auxiliaries," by K. T. Oakley.

IPSWICH. — Electric House, 7.15 p.m. Ipswich and District Electrical Association. "Electricity Supplies in Canada and U.S.A.", by R. H. Barkham.

LIVERPOOL. — Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "The Importance of Research in Hearing and Seeing to the Future of Telecommunication Engineering," by Dr. E. C. Cherry.

LONDON.—Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduate and Student Section. Address by President.

NEWCASTLE-UPON-TYNE. — King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurement Group. "A New Cathode-Ray Tube for Monochrome and Colour Television," by Dr. Gabor, P. R. Stuart and P. G. Kalman.

Tuesday, 18th November

ALDERSHOT.—Red Cross Hall, High Street, 7.30 p.m. A.S.E.E. Aldershot and Districts Branch. "Power Transformers," by P. G. Sanderson.

BROADSTAIRS.—Clarendon Hotel, 8 p.m. A.S.E.E. East Kent Branch. "Sound Production," by F. H. Brittain.

GLASGOW. — Grosvenor Restaurant, 6.30 p.m. I.E.E. Scottish Centre. Annual dinner-dance.

LEEDS. — C.E.G.B. Offices, 1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Utilisation Group. "Electrification of the U.K.A.E.A. Industrial Group Factories," by J. W. Binns and W. J. Outram.

LIVERPOOL.—Merseyside and N. Wales Electricity Board Industrial Development Centre, 6 p.m. I.E.S. Liverpool Centre. "Recent Industrial Installations and Some Particular Problems," by J. G. Holmes.

LONDON.—Savoy Place, 5.30 p.m. I.E.E. Measurement and Control Section. Discussion on "Ferro-Electrics," opened by L. A. Thomas.

Magnet House, Kingsway, W.C.2, 6.15 p.m. A.S.E.E. London National Lecture. Joint meeting with Institution of Engineers-in-Charge. "Problems of Railway Electrification," by R. Ledger.

MANCHESTER. — Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Measurement and Control Group. "Direct-Reading Iron-Loss Testing Equipment for Single Sheets, Single Strips and Test Squares," by J. McFarlane, P. Milne and J. K. Darby, and "The Control of Flux Waveforms in Iron Testing by the Application of Feedback Amplifier Techniques," by J. McFarlane and M. J. Harris.

NEWCASTLE-UPON-TYNE. — Crown Hotel, 7.30 p.m. A.S.E.E. Tyneside Branch. Calder Hall Films.

OXFORD.—Employment Exchange, 7.30 p.m. A.S.E.E. Oxford and District Branch. "The I.E.E. Regulations and the National Inspection Council," by J. Looker.

Wednesday, 19th November

CARDIFF.—Park Hotel. Combustion Engineering Association, Western Region. 10.30 a.m. "Smoke Abatement," by J. Lawrence. 2.15 p.m. "Grit and Dust Collecting Equipment for the Smaller Plant," by G. Oddy, followed by an open discussion.

DARTFORD.—Railway Hotel, 7 p.m. Incorporated Plant Engineers, Kent Branch. "Cathodic Protection," by L. B. Hobgen.

LONDON.—B.B.C. Television Centre, Wood Lane, W.12, 3 p.m. I.E.E. London Graduate and Student Section. Visit.

Savoy Place, 5.30 p.m. I.E.E. Radio and Telecommunication Section. "Television Recording: A Survey of the Problems and the Methods Currently in Use," by J. Redmond.

Dorchester Hotel. Radio Industry Council. Dinner.

Manson House, Portland Place, W.1, 2.30 p.m. to 6.30 p.m. Society of Instrument Technology, London meeting. Symposium on Analytical Instrumentation Developed at Harwell.

Café Royal. 6.30 for 7 p.m. Dynamicables. Dinner.

NEWCASTLE-UPON-TYNE. — King's College, Stephenson Buildings, 7 p.m. Society of Instrument Technology, Newcastle Section. "Flow Measurement with Particular Reference to the Dall Tube," by D. H. Kent.

NOTTINGHAM. — Victoria Station Hotel, 7 p.m. I.E.E. East Midland Centre. Annual dinner.

Mechanics' Institution, Trinity Square, 7.30 p.m. A.S.E.E. Nottingham Branch. "The Electricity Regulations," by S. J. Emerson.

PRESTON.—North Western Electricity Board, 19, Friargate, 7 p.m. I.E.S. North Lancashire Group. "The Use of Lighting for the Prevention of Crime and Accident," by Inspector J. J. Betts.

RUGBY.—Rugby College of Engineering Technology, 6.30 p.m. I.E.E. Rugby Graduate and Student Section. "An Electrical Engineer and East Africa," by Dr. J. R. Mortlock.

SALISBURY.—17, New Canal, 6.30 p.m. I.E.E. Southern Centre. "Colour Television," by C. J. Stubbington.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "The Design and Performance of the Gas-Filled Cable System," by E. P. G. Thornton and D. H. Booth.

SOUTHAMPTON.—Polygon Hotel, 8 p.m. A.S.E.E. Southampton Branch. Joint lecture with Electrical Contractors' Association.

WOLVERHAMPTON.—Chamber of Commerce, Lichfield Street, 7.45 p.m. A.S.E.E. Wolverhampton and District Branch. "Industrial and Commercial Radio Communications," by W. J. Anderson.

Thursday, 20th November

BLACKBURN.—White Bull Hotel, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "The Application of Plant and Instrumentation to the Testing of Gas Turbine Combustion Chambers," by Dr. A. E. Clarke.

CHELMSFORD. — Hoffmann's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Electric Cable Manufacture," by W. H. Lythgoe.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Space Heating by Electricity," by P. Walsh.

LONDON.—Savoy Place, 6 p.m. I.E.E. Education Discussion Circle. "What is a Cultured Engineer?" opened by Dr. K. R. Sturley.

University of London Institute of Education, Malet Street, W.C.1, 7 p.m. Institution of Electronics, London Division. "The Applications of Transistors in Communications and Control Equipment," by E. Wolfendale.

Café Royal, W.1, 12.15 for 1 p.m. Federation of British Industries, London and South Eastern Region. Annual general meeting and luncheon.

LOUGHBOROUGH. — College of Further Education, Greenclose Lane, 7 p.m. Society of Instrument Technology, East Midland Section. "Control of the Jodrell Bank Radio Telescope," by P. J. Bhatt.

LUTON.—Staff Canteen, D. Napier & Sons, The Airport, 6 p.m. I.E.E. London Graduate and Student Section. District meeting. "The Application of Electronics to Jet Engine Control," by H. E. Coles.

PRESTON. — A.S.E.E. Preston Branch. Dinner and dance.

Friday, 21st November

BIRMINGHAM.—Midland Institute, 6.30 p.m. I.E.E. South Midland Centre, Institution of Civil Engineers and Institution of Mechanical Engineers. "Operational Experience at Calder Hall," by K. L. Stretch.

New Billesley Arms Hotel, Kings Heath. A.S.E.E. Birmingham Branch. Dinner.

CARLISLE.—Technical College, 7 p.m. I.E.E. North Eastern Centre. "Some Aspects of Heat-Pump Operation in Great Britain, with particular reference to the Shinfield Installation," by Miriam V. Griffith.

EDINBURGH.—Roxburghe Hotel, Charlotte Square. Incorporated Plant Engineers, Edinburgh Branch. Annual dinner.

LEICESTER. — Coronation Hotel. I.E.S. Leicester Centre. Social evening.

LONDON.—14, Rochester Row, S.W.1, 7 p.m. Junior Institution of Engineers. "Printed Circuit Techniques," by P. A. Trigg.

1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers. "The Transmission of Acoustic Waves Through Structures," by Professor L. L. Beranek.

MANCHESTER. — Engineers' Club, Albert Square, 7 p.m. A.S.E.E. Manchester Branch. "The Development of Television," by R. T. B. Wynn.

PETERBOROUGH.—Incorporated Plant Engineers, Peterborough Branch. Annual dinner and dance.

STOKE-ON-TRENT. — Technical College, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "Electrical Floor Warming," by J. W. Moule and W. M. Stevenson.

WEMBLEY PARK.—Century Hotel, Forty Avenue. A.S.E.E. North West London Branch. Annual dinner and dance.

WHITLEY BAY.—Rex Hotel. North East Electrical Club. Annual dinner.

Saturday, 22nd November

AVONMOUTH.—I.E.E. Bristol Graduate and Student Section. Visit to the National Smelting Co., Ltd., 10 a.m.

FARNBOROUGH.—R.A.E. I.E.E. Radio and Telecommunication Section. Section soirée.

MANCHESTER.—Bavarian Suite, Belle Vue, 7 p.m. A.S.E.E. Ladies' evening.

Building Technicians' Diary

The Association of Building Technicians, 1, Ashley Place, London, S.W.1, has issued its 1959 Building Technicians' Pocket Diary. This contains over 150 pages of useful information and data for all those engaged in the building industry, including those carrying out electrical installation work. In addition to the usual diary information, there are a number of sectional maps of the British Isles. The diary can be obtained from the Association (rexine binding 6s 2d and leather binding 7s 8d).

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Aberdeen.—Corporation. 1st December. Electric lamps. (See this issue.)

Australia.—Electricity Commission of New South Wales, Sydney. 1st December. 10 MVAR, 33 kV capacitor banks. (E.S.B. 27040/58. Ten/35607.)*

Ballynahinch (Co. Down).—25th November. Electrical installation at Assumption Grammar School. C. P. McNally, 143, Royal Avenue, Belfast.

Belgian Congo.—Ministry of Colonies, Brussels. 1st December. Road signal panels. (E.S.B. 26574/58. Ten/35630.)*

Belgium.—Regie des Telegraphes et des Telephones de Belgique. 19th November. Telephone cables. (E.S.B. 27073/58. Ten/35609.)*

Burma.—Burma Purchase Board, Rangoon. 20th November. Conductor cable. (E.S.B. 27258/58. Ten/35639.)* Insulated cable. (E.S.B. 27256/58. Ten/35641.)* 26th November. Two electrically-driven sewage pumps. (E.S.B. 27406/58. Ten/35678.)* Batteries. (E.S.B. 27407/58. Ten/35677.)*

Applied Research Institute, Ministry of Industry, Rangoon. 25th November. Electrical apparatus, including testing equipment. (E.S.B. 26558/58/I.C.A. Ten/35534.)*

Edinburgh.—North of Scotland Hydro-Electric Board. 132 kV double circuit transmission line. (See this issue.)

Greece.—State Procurement Service, Athens. 22nd November. Twenty electric refrigerators. (E.S.B. 27082/58. Ten/35606.)* 26th November. Telecommunications material. (E.S.B. 27079/58. Ten/35642.)* 25th November. Transmitters. (E.S.B. 27080/58. Ten/35632.)*

Iran.—Plan Organisation, Teheran. 17th November. Two electric pumps. (E.S.B. 27600/58. Ten/35684.)*

Iran State Railways, Teheran. 22nd December. Copper wire and galvanised iron. (E.S.B. 26613/58. Ten/35524.)*

Iraq.—Central Foreign Purchase Committee, Ministry of Finance. 20th December. Transmitters. (E.S.B. 27162/58. Ten/35651.)*

Korea.—Government Office of Supply, Seoul. 29th November. Wire strand, telephone cable and solder. (E.S.B. 27245/58/I.C.A. Ten/35694.)*

Lebanon.—Development Department for Hydraulics and Electricity, Beirut. 17th December. Diesel-electric locomotives, freight box and flat cars. (E.S.B. 26578/58/I.C.A. Ten/35532.)*

Manchester.—Corporation. 26th November. Works telephone equipment and road lighting equipment at Davyhulme sewage works. (See this issue.)

Newry (Co. Down).—28th November. Electrical installation in girls' intermediate school. Varming & Mulcahy, consulting engineers, 37, Malone Road, Belfast.

New Zealand.—Wellington Corporation. 25th November. H.v. and l.v. cable. (E.S.B. 26809/58. Ten/35572.)* 27th November. H.v. switchgear. (E.S.B. 26856/58. Ten/35575.)*

G.P.O., Wellington. 5th December. Cable and testing equipment. (E.S.B. 26807/58. Ten/35544.)*

Dunedin Electricity Department. 19th December. Insulated copper cable. (E.S.B. 27343/58. Ten/35657.)*

Pakistan.—Posts and Telegraphs Department, Karachi. 26th November. Paper sleeves for insulating conductor joints. (E.S.B. 27379/58. Ten/35701.)*

Portuguese East Africa.—Ports, Railways and Transport Department, Lourenço Marques. 15th December. 660 kW motor-generator sets and accessories. (E.S.B. 26845/58. Ten/35545.)*

Rhodesia and Nyasaland.—City Engineer's Department, Salisbury. 9th December. Pumps, motors, switchgear, valves, pipes, gantry crane and fittings for Matapi sewage pumping station. (E.S.B. 26768/58. Ten/35523.)*

Bulawayo Electricity Department. 3rd December. Overhead line and service materials. (E.S.B. 26799/58. Ten/35581.)*

Rhondda.—Corporation. 29th November. Street lighting equipment. (See this issue.)

Ripon and Pateley Bridge.—R.D.C. 26th November. Duplicate sewage ejectors, complete with motors, compressors, starters and accessories. John H. Haiste & Partners, consulting engineers to Council, Belmont House, 20, Wood Lane, Headingley, Leeds, 6.

South Africa.—Johannesburg City Council. 20th November. Traffic signal heads. (E.S.B. 26977/58. Ten/35611.)*

Union Tender and Supplies Board, Pretoria. 27th November. Plastics battery boxes. (E.S.B. 27016/58. Ten/35589.)* 4th December. H.v. switchgear. (E.S.B. 26874/58. Ten/35538.)* H.v. switchboard. (E.S.B. 26873/58. Ten/35537.)* Switch and fuse gear. (E.S.B. 26876/58. Ten/35576.)* 11th December. 500 kVA transformer. (E.S.B. 26872/58. Ten/35539.)* Resistance units. (E.S.B. 27013/58. Ten/35626.)*

Stores Department, South African Railways, Johannesburg. 28th November. Secret telephones. (E.S.B. 27137/58. Ten/35619.)*

Cape Provincial Administration. 28th November. X-ray apparatus. (E.S.B. 26798/58. Ten/35588.)*

Spondon (Derbyshire).—Parish Council. 24th November. Lighting installation, Borrowash by-pass. (See this issue.)

Tasmania.—Hydro-Electric Commission, Hobart. 24th February. Generating plant for Poatina power station. (E.S.B. 14662/58. Ten/35587.)*

Welton. — R.D.C. 12th December. Duplicate sewage pumps, together with sludge and supernatant water pump, complete with motor starters and accessories; duplicate sewage ejectors, complete with motors, compressors, starters and accessories. John H. Haiste & Partners, consulting engineers, Belmont House, 20, Wood Lane, Headingley, Leeds, 6.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).

ORDERS PLACED

Dudley.—Streets, Transport and Lighting Committee. Contract No. 2 of the street lighting five-year programme (£20,622).—Revo Electric Co. Cabling, jointing, etc., in connection with the contract (£11,577).—Midlands Electricity Board.

Glasgow.—Education Committee. Electrical installation work at secondary school, Cranhill (£22,080).—J. B. Meiklejohn.

London.—Metropolitan Water Board Works and Stores Committee. Recommended. Supply and installation of power, control and telephone cables, etc., at the Lockwood and Stoke Newington shafts of the Thames-Lee Valley water main and at Ferry Lane, Chingford South and Stoke Newington pumping stations (£17,161).—George E. Taylor & Co. (London). Accepted. Electrically driven 15-ton overhead travelling crane, complete with ancillary equipment, and dismantling an existing 12-ton hand-operated crane at Walton pumping station (£7,535).—John Smith (Keighley).

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Alnwick.—Remodelling of Duke's Grammar School (£60,000); J. G. Green & Son, builders, Warkworth.

Aylesbury.—Houses (200), Tring Road; H. C. Janes, Ltd., builders, 189, Hightown Road, Luton.

Ayr.—Apprentices' school and laboratory; Scottish Stamping & Engineering Co., Ltd., Neptune Works.

Bristol.—Works extensions for Burleigh, Ltd.; Clifton Bros., Ltd., builders, Fishponds.

Camberley.—Houses (120), Rorkes Drift site; Homeville Builders, Ltd., 12, Craufurd Rise, Maidenhead.

Cirencester.—Police station, magistrates' court and other buildings in connection with central redevelopment scheme; J. W. Elliott, surveyor, Municipal Offices, Gosditch Street.

Dalkeith.—Houses (54), Woodburn Loan; A. Forrester, burgh architect, Municipal Buildings.

Dover.—Redevelopment of Buckland Hospital; South East Metropolitan Regional Hospital Board, 9, Hallam Street, London, W.1.

Dundee.—Houses (900), Craigie estate; R. Dron, city architect, 17, City Square.

Edgware.—Community centre, Hale Road; Dennis S. Lichtig, architect, Parelease Hill, Loughton.

Great Yarmouth.—Central library reconstruction (£124,000), new police headquarters (£100,000) and hostel accommodation, Magdalen College estate (£70,000); borough surveyor, 15, Regent Street.

Horley.—Mixed school and county primary school; J. Harrison, Surrey county architect, County Hall, Kingston-upon-Thames.

Leeds.—Scheme for multi-storey blocks of flats on site off Raynville Road, Bramley; city architect, Priestley House, Quarry Hill, 9.

Lowestoft.—Four-storey hostel on site near Lowestoft Docks; Royal National Mission to Deep Sea Fishermen, 43, Nottingham Place, London, W.1.

Marlborough.—Grammar school; county architect, County Hall, Trowbridge.

Oswestry.—Houses (48), Swan Lane; G. Whitmore, architect to T.C., Oswestry.

Peterhead.—Works extensions; Crosse & Blackwell, Ltd., Kirk Square.

Richmond (Surrey).—Works, Victoria Villas site; J. Burley & Sons, Ltd., 1, Brooklands Road, Weybridge.

Rochester.—Houses (80); city surveyor, 66, Maidstone Road.

Southampton.—Health clinic, Harefield estate; G. H. Buckle & Partners, consulting engineers, 13, Gabriels Hill, Maidstone.

Stokesley.—Bungalows (38), Great Broughton and Yarm; R.D.C. surveyor.

Thedwastre.—Council offices at Elmswell, Suffolk; Mitchell & Weston, architects to Rural Council, 38, Churchgate Street, Bury St. Edmunds.

Warwicks.—Erection of new school at Ilmington; G. R. Barnsley, county architect, Shire Hall, Warwick.

West Bromwich.—Reconstruction of baths (£265,000), including restaurant, boiler house, plant, etc.; borough surveyor, Town Hall.

Wrexham.—Erection of new wing at Chevot Hey Reception Centre, Greenfield, Rhosddu; R. McFarlane, county architect, Grove Park, Wrexham.

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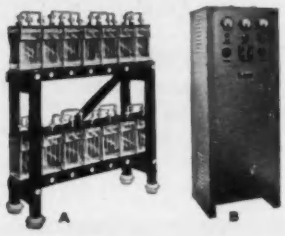

A *Double-tier stand holding a typical battery of 14 Tudor sealed-type cells as used with 'Safetylyte' emergency lighting equipment.*

B *'Safetylyte' Major charging and control cubicle.*

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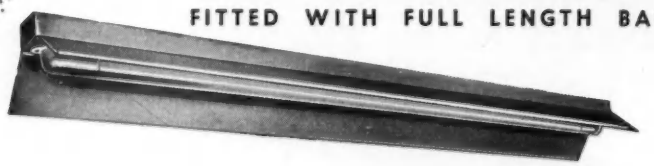

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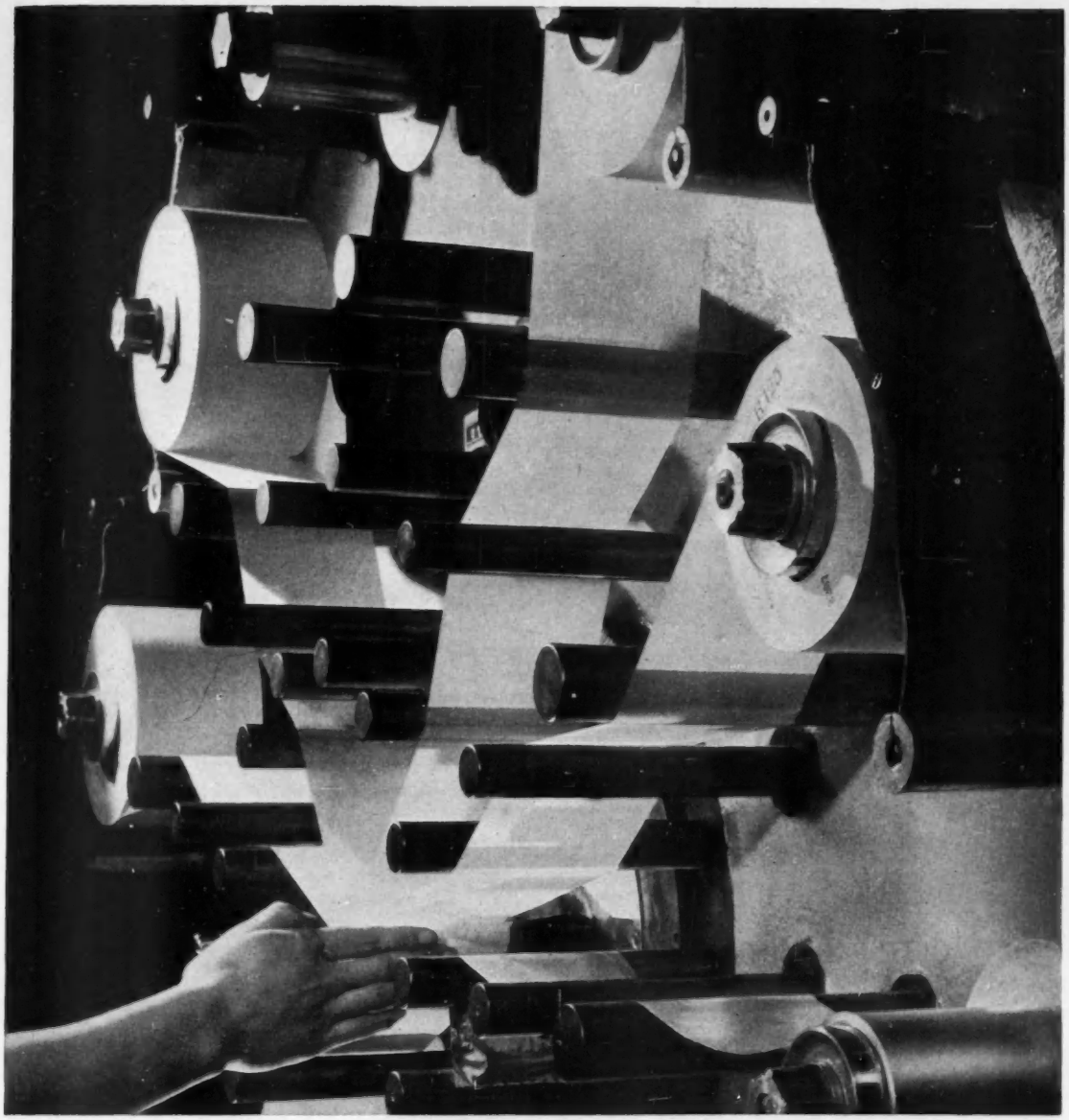

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Atlas tubes are manufactured to strike on a supply voltage as low as 185 volts and electronic testing gear incorporated in the manufacturing units is set to reject any tubes which will not strike at this figure. This provides an ample margin under all normal conditions.

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It must be emphasised that it is the inherent ability of a tube to strike at low voltages which primarily determines its suitability for switchless-start circuits. External treatment of the tube helps under humid conditions, but neither sylcoating nor the use of an external metal strip will ensure satisfactory operation on this type of circuit of a tube which requires a high striking voltage. In the past it has been considered necessary to have an earthed metal surface in close proximity to the tube (usually provided by the fitting) but experience with Quickstart tubes of current manufacture has shown that this is not essential on the normal 230/250v. supplies.

In the past a proportion of Atlas tubes has been low voltage tested and sylcoated (Quickstart grade) for switchless-start operation. In view of the growth in use of this type of circuit, and in order to simplify stocking and distribution problems, every Atlas tube will in future be low voltage tested and the manufacturing units have now been modified to incorporate automatic sylcoating of the entire production so that as from the 17th November every standard Atlas tube, in all "White" colours and lengths, will be suitable for use with switch or switchless-start circuits on 200/250 volt supplies. The Atlas 'GP Quickstart' general purpose tube eliminates the need for external conducting strips which will not in future be supplied.

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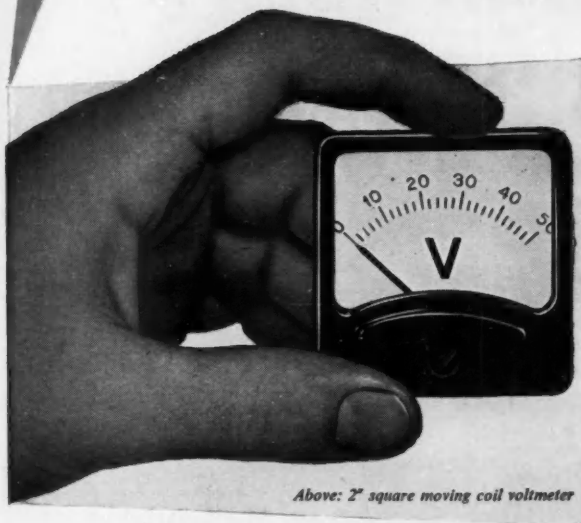

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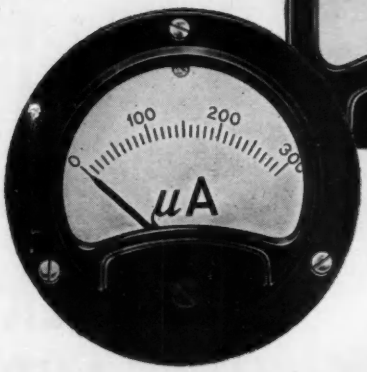

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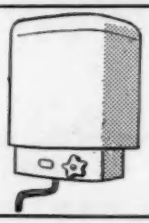

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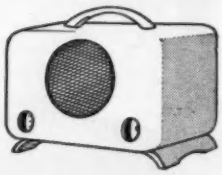

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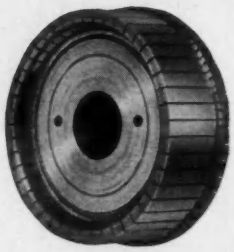

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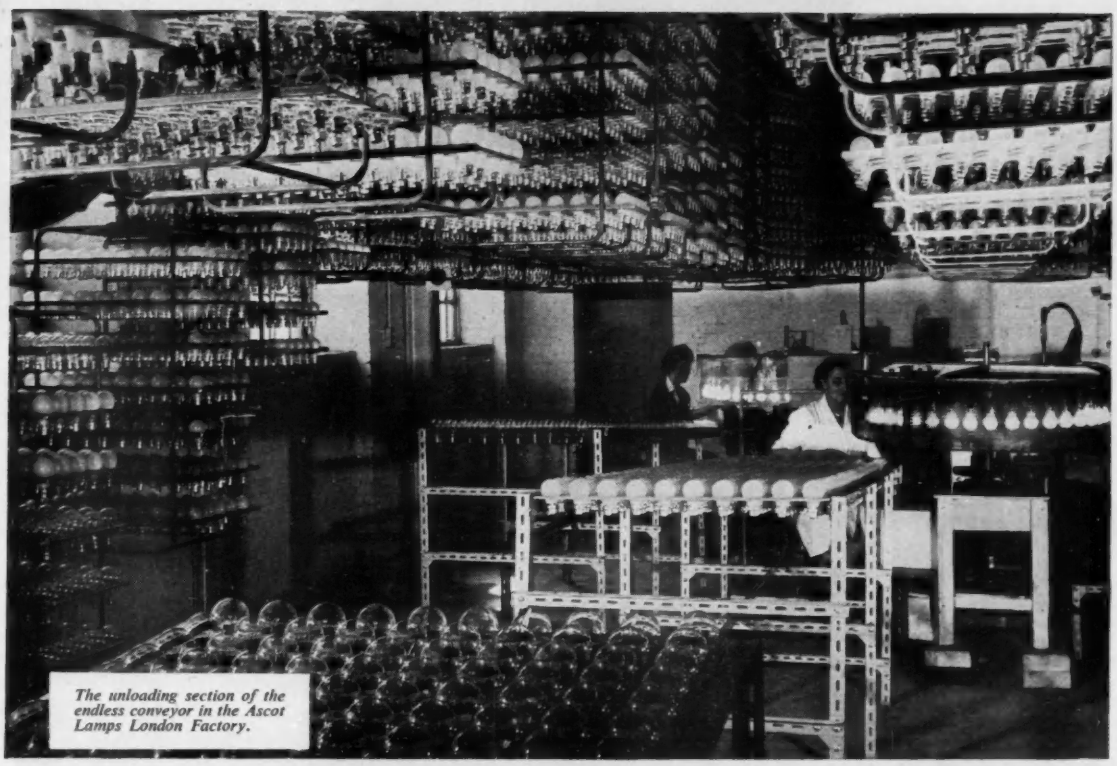

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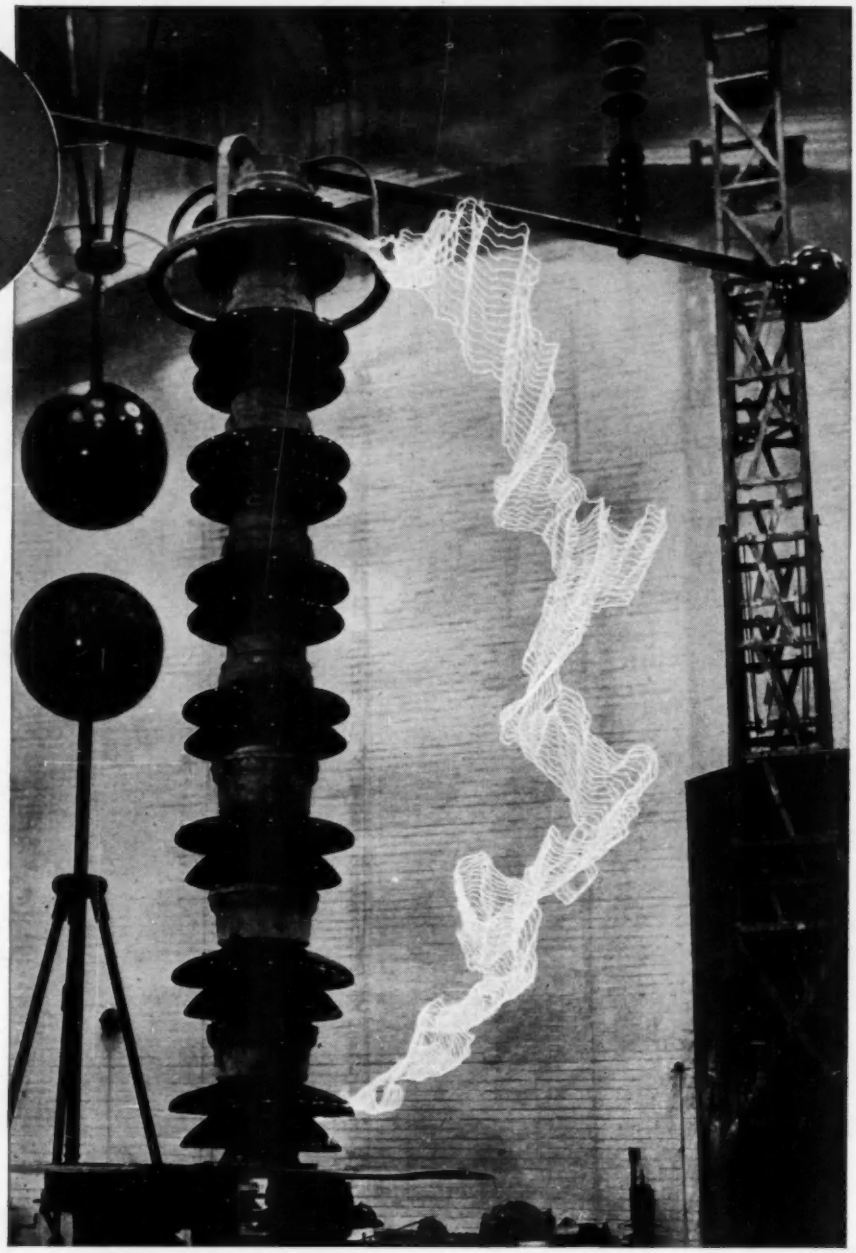

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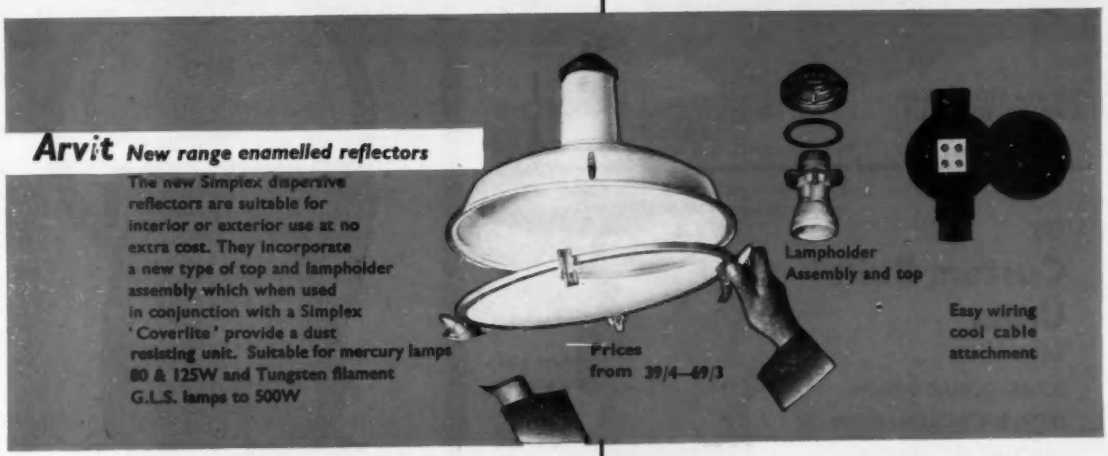
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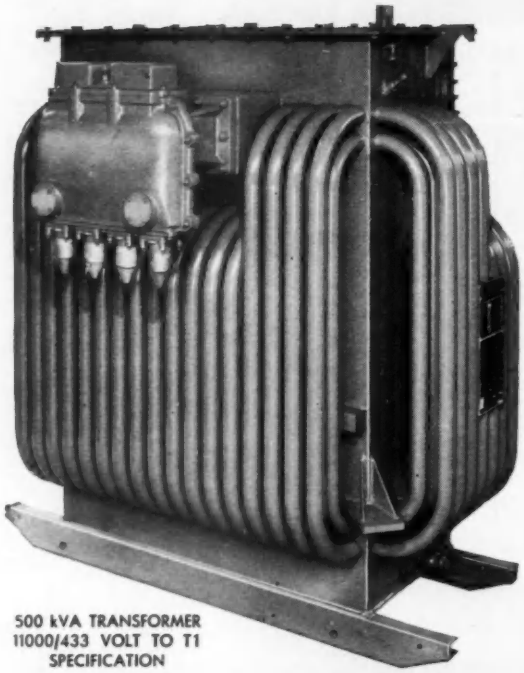

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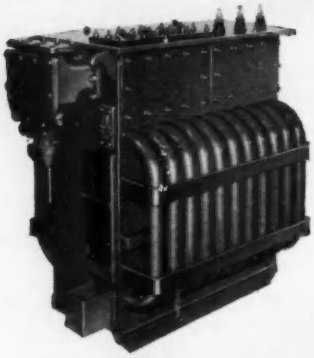

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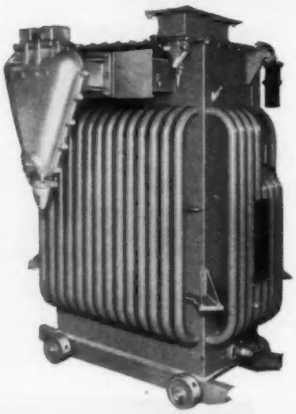

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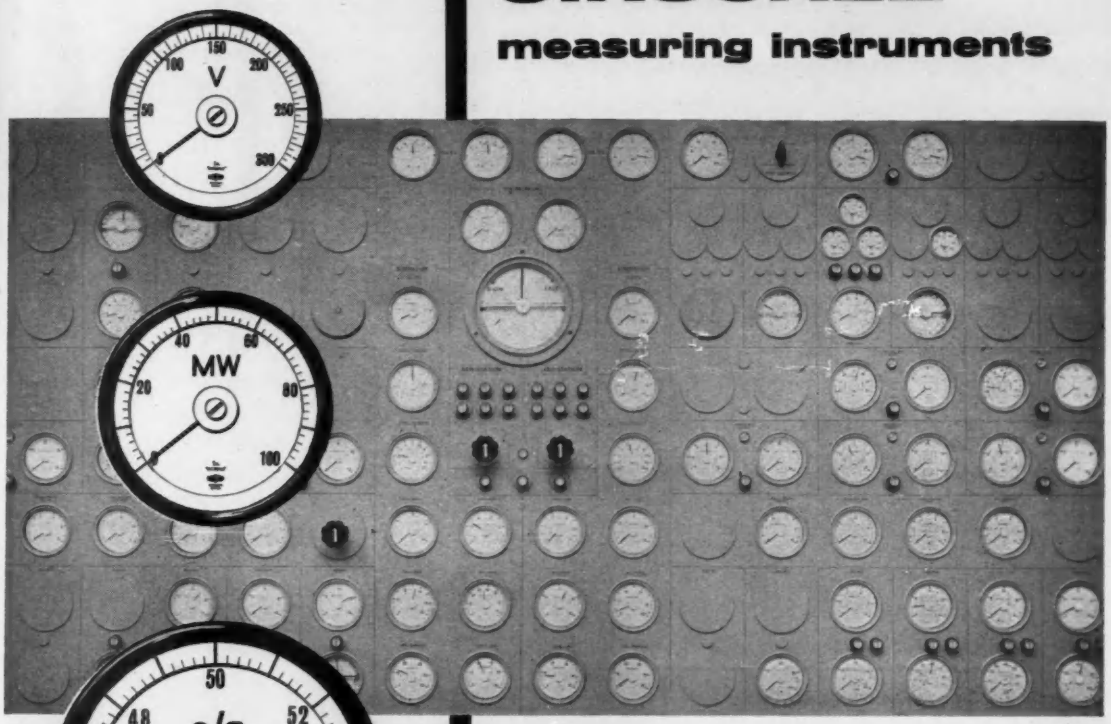

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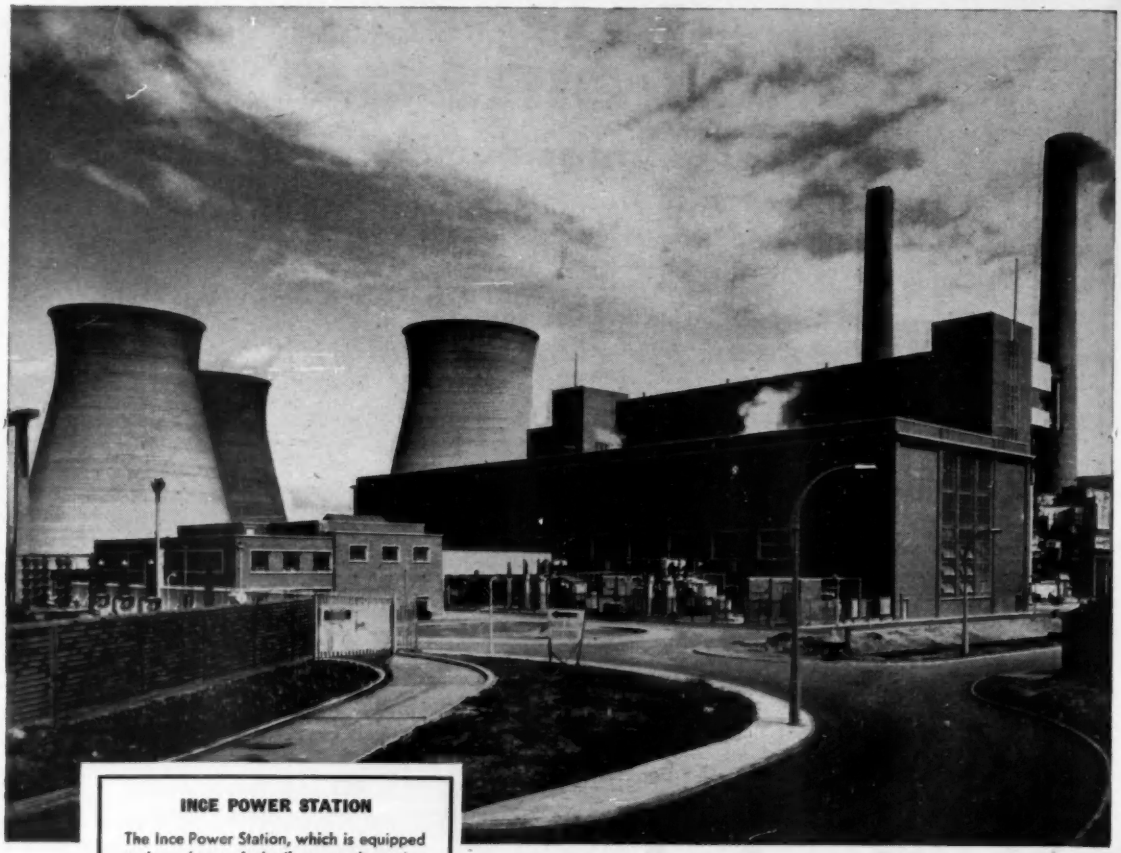

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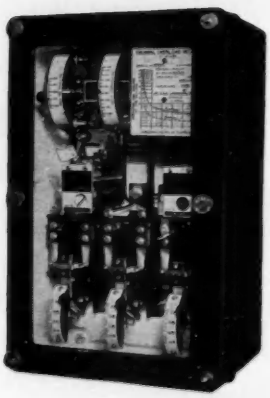

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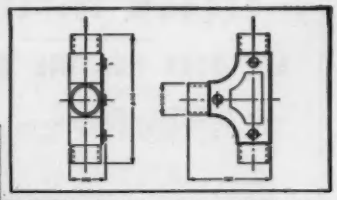

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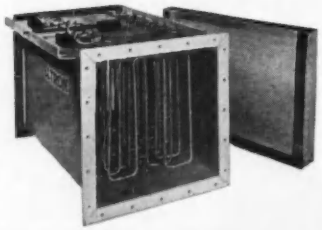

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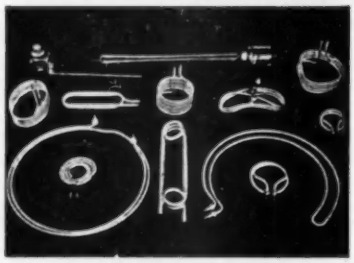

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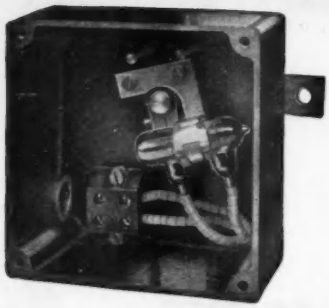

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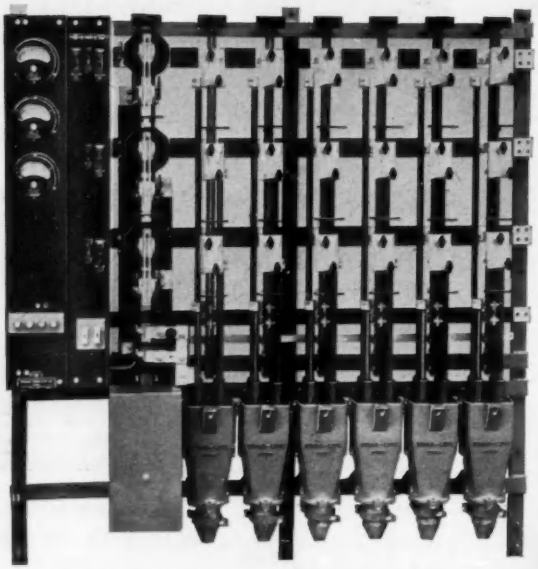

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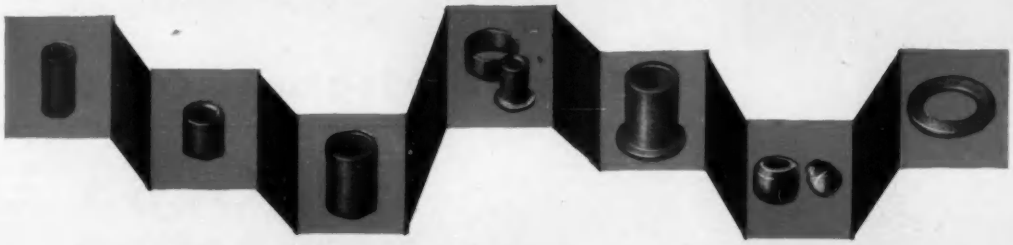

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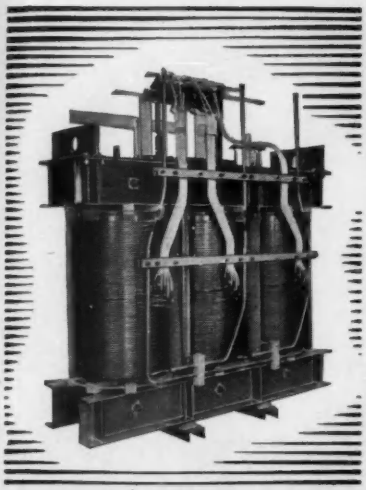

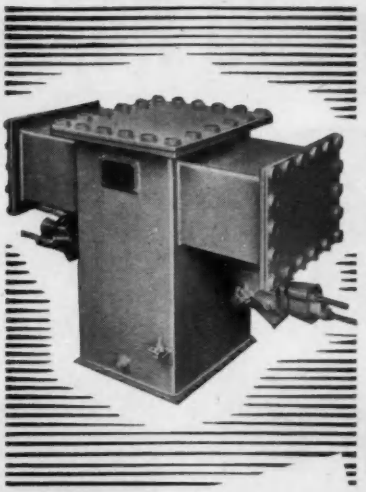

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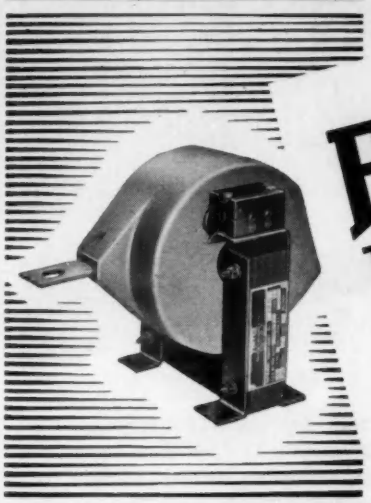

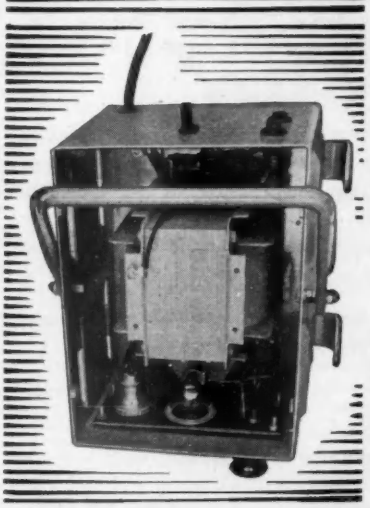

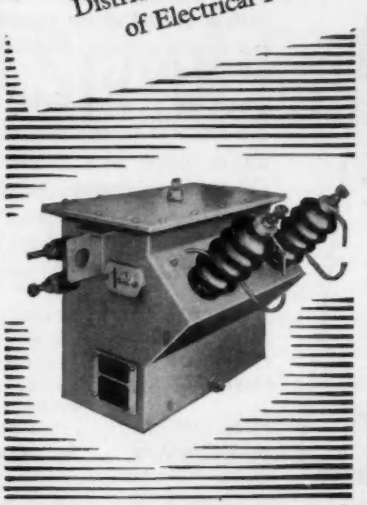

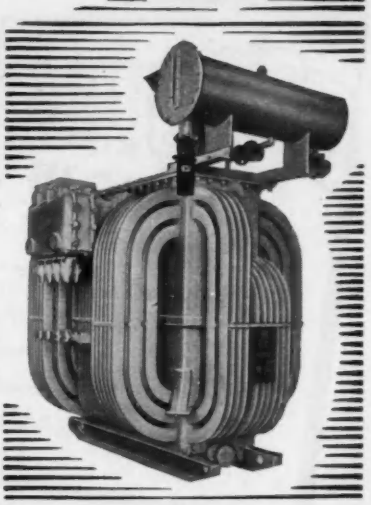

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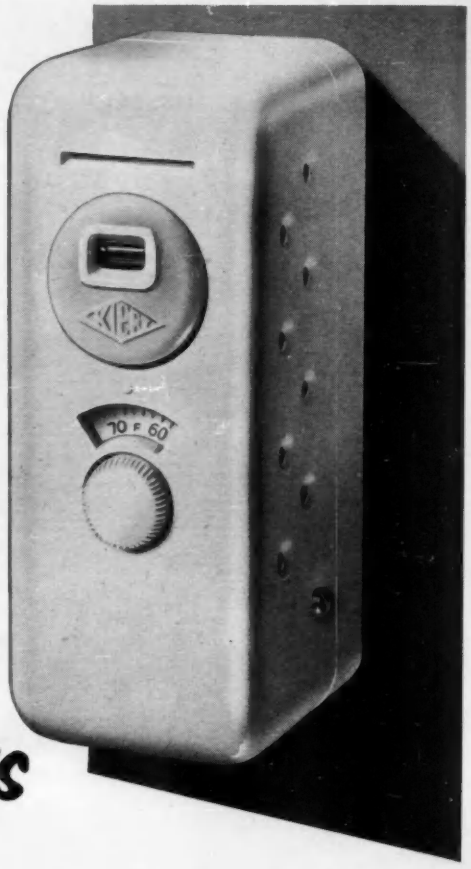

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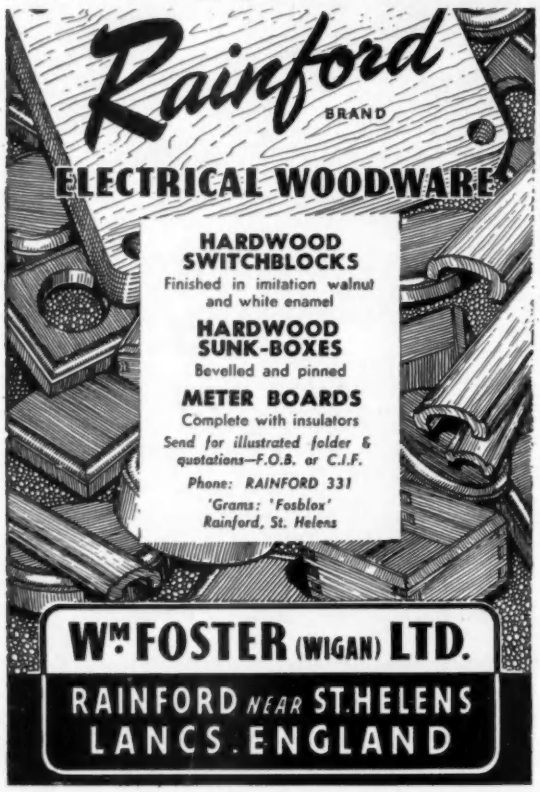

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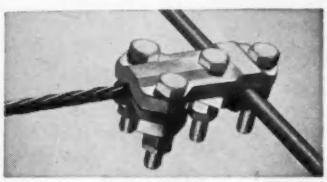

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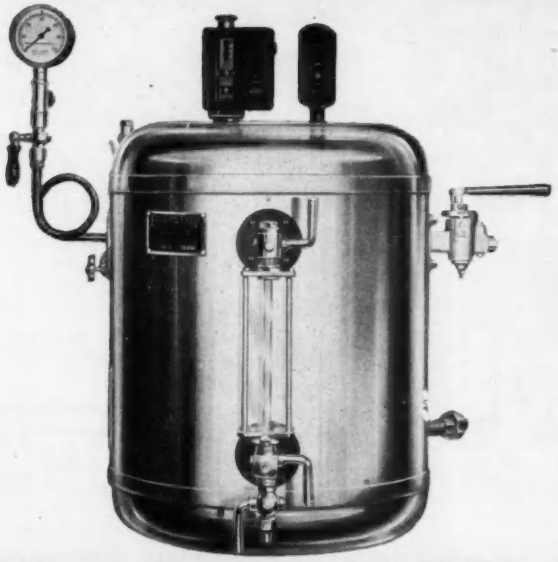

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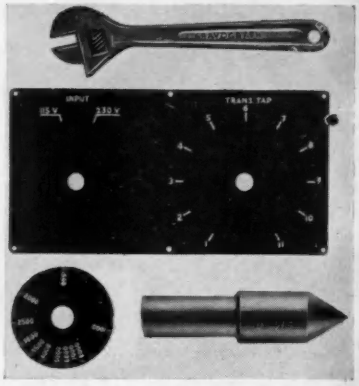

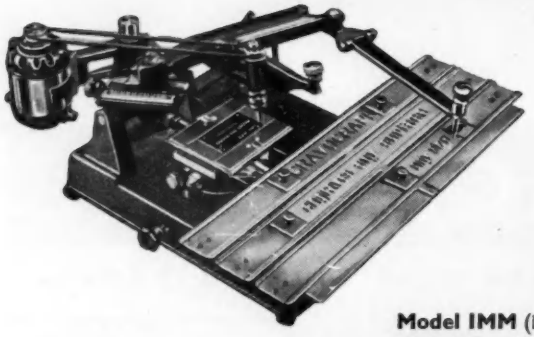

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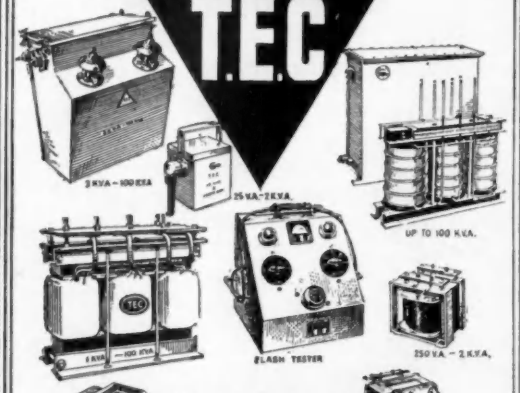

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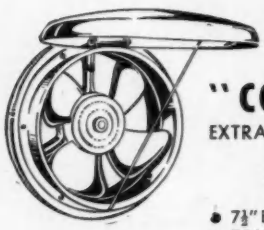

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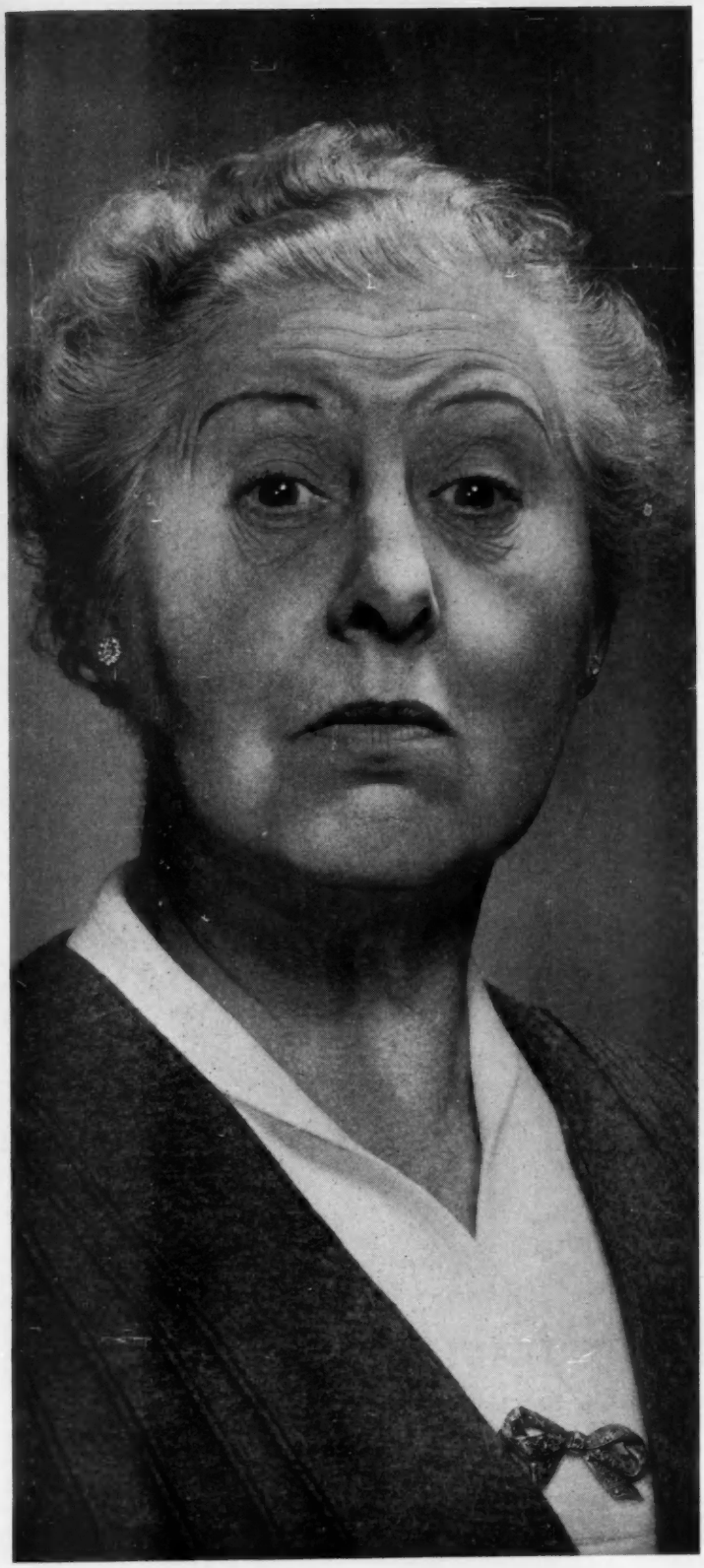

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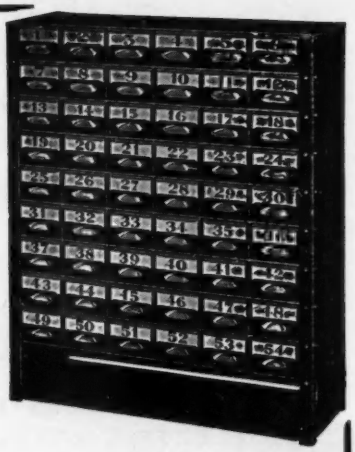

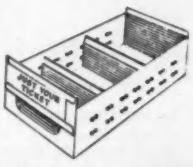

Contains 54 of these drawers, each 5" wide, 3" high, 11¼" long. 54 dividers and 54 drawer cards with each unit. Extra dividers 6d. each.

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DELIVERED FREE ENGLAND, SCOTLAND, WALES
SEND FOR SAMPLE DRAWER

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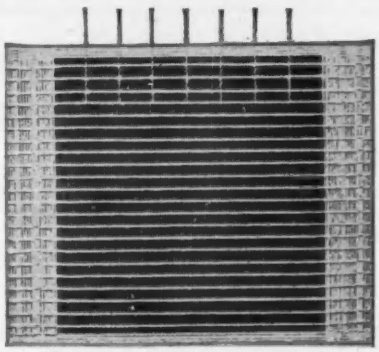
Can you say Woven Asbestos resistances ensure safe, sure service six times, quickly?

It's a mouthful, but fortunately you only have to say it once — preceded, of course, by the name CRESSALL. CRESSALL Asbestos Woven Resistance Nets are light, flat, rigid, vibration and shock proof and require only the simplest of supports for making up into banks.



It is now 45 years since we introduced Asbestos Woven Resistance Grids into this country, and the consequent steadily increasing demand is sufficient proof of the wide field in which this type of resistance unit is pre-eminent.

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. . . are produced for bread wrapping machines and other sealing machines. Strip heaters for heating platens are available both with mica and ceramic insulation according to operating conditions. Tubular heaters are made with Inconel, stainless steel, copper and other non-ferrous sheaths in diameters from $\frac{1}{16}$" to $\frac{1}{2}$". Your enquiries are invited.

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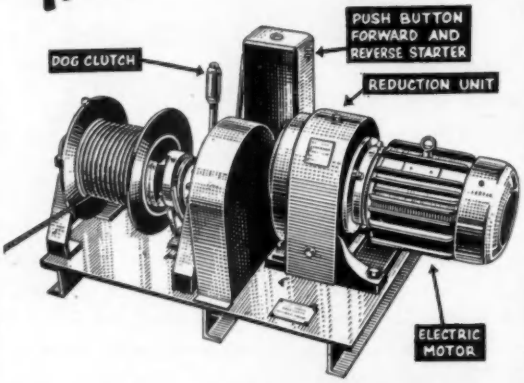

The 3-ton pull Electric Winch with a rope speed of 30 ft. per minute shown above is just one of many electrically powered winches which we have designed specially to meet the particular needs of a customer. Let us advise you on your hauling problem.

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65 watt oval tapered bit (Illustrated)

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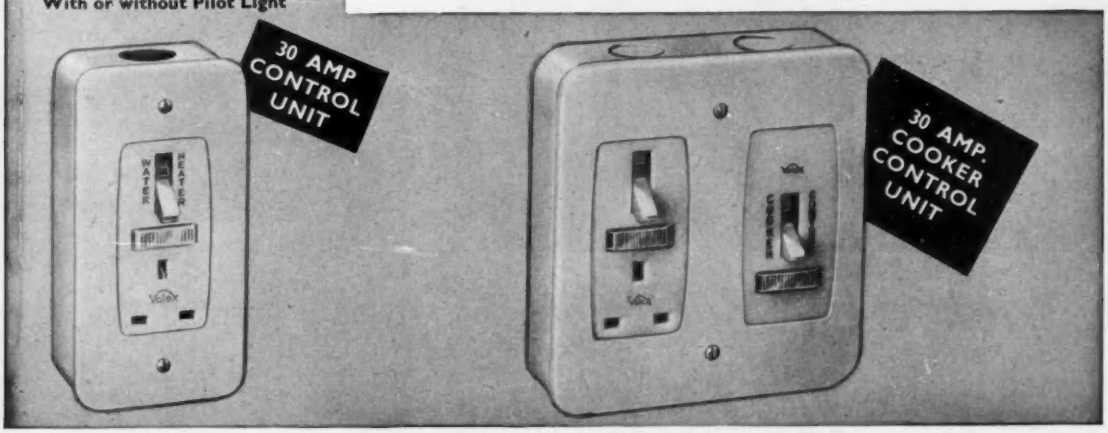
With or without Pilot Light

METAL CLAD
With or without Pilot Light

It is impossible to detail here the vast range of these extremely adaptable 30 amp. D.P. Isolating Switches and Control Units. We therefore invite you to send for our illustrated leaflet giving full particulars of complete range and prices.

Insulated cover types are available in Cream or Brown finish and metal clad types, either flush or surface mounting in attractive Cream stove enamel finish with optional alternatives of satin chrome plates.

Available from your usual wholesale suppliers.



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With 13 amp. 3 pin Sub-circuit.
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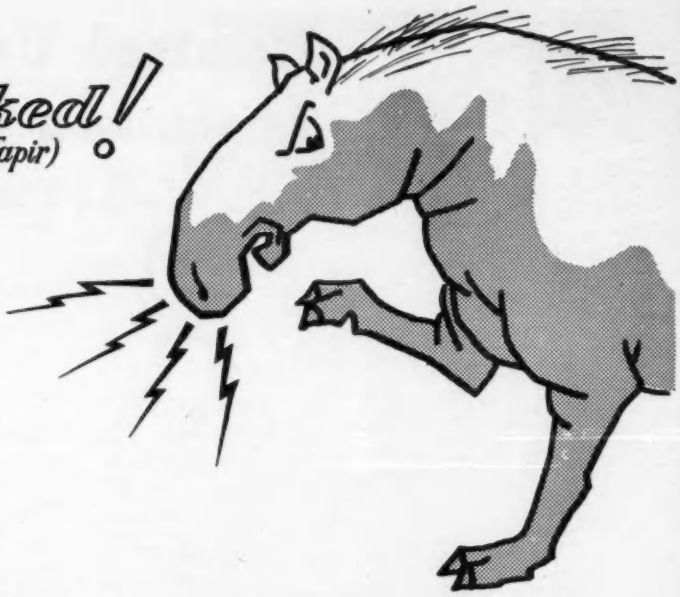
I was *shocked!*
(said Timothy Tapir)



Tim Tapir's long enquiring snout
As Tapirologists agree
Is not designed to root about
The realms of 'electricitee'
So when you're wiring up a job
Where Ohm's law is applicable
Use DILEC Tape for Tapir's sake
And make him more amicable.

DILEC tape has been specially developed for the electrical industry.

DILEC is imperishable—**there is no adhesive liable to breakdown or perish** under severe atmospheric or other conditions. It is non-inflammable, will not cone or telescope, is impervious to moisture and is highly resistant to most acids, chemicals, atmospheric conditions, etc.

DILEC has a high dielectric strength, a high tensile strength, and excellent elongation to enable it to conform easily to all surfaces.

DILEC is easy to handle and clean in use. It can be heat sealed, cemented or H.F. welded.

...take a tip from Timothy Tapir

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THE DEPENDABLE ELECTRICAL TAPE BY **Gosheron**

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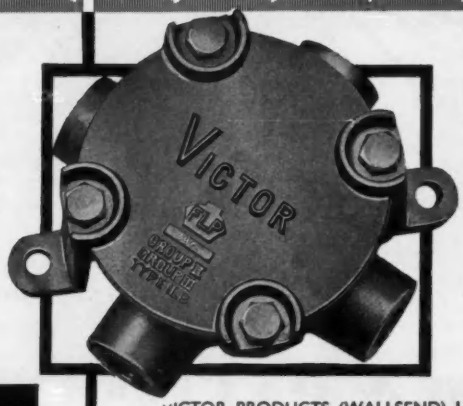
THE PACKAGING TAPE CENTRE (Regd.) · 79-81 ALBERT EMBANKMENT, LONDON, S.E.11: RELIANCE 7600

Weatherproof and Flameproof

LIGHTING EQUIPMENT

For exposed positions, VICTOR offer a comprehensive range of fully weatherproof-flameproof lighting fittings. By separating F.L.P. and weatherproof joints, a completely hermetically-sealed unit is achieved. Available in several designs to suit virtually every position.



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In the junction box range, similarly independent F.L.P-Weatherproof paths are provided in these, the first fully weatherproofed boxes in the field.

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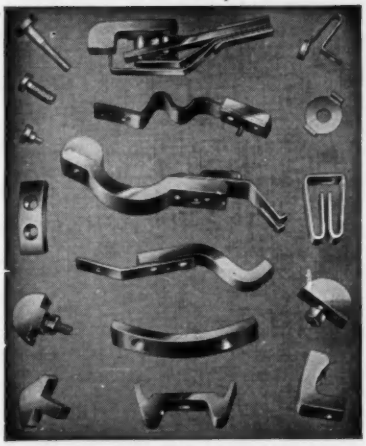

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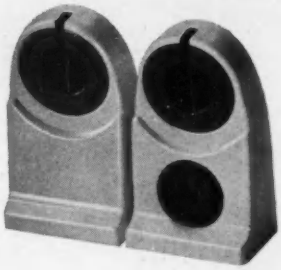

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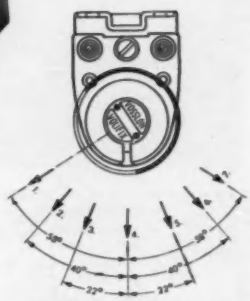

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Available for single or twin fittings

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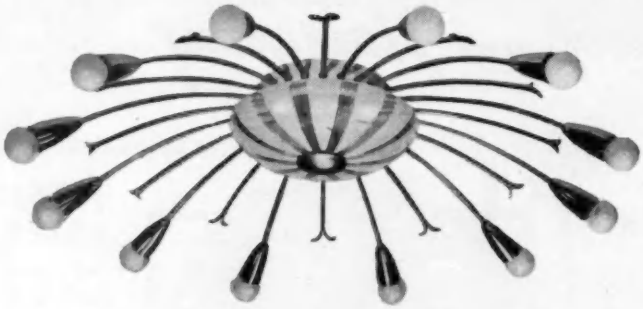
Lighting Season, 1958-59



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Contemporary and Traditional styles in every price range

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Master and Slave Units

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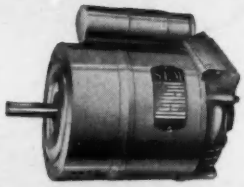
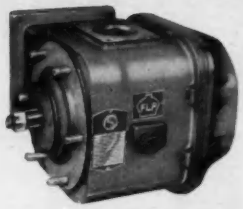
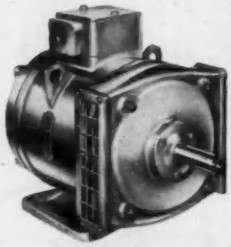
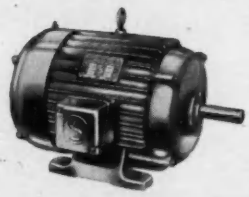


will serve you better







WE have an enthusiastic team of qualified engineers to study your problem.

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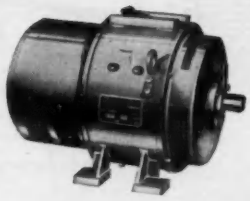
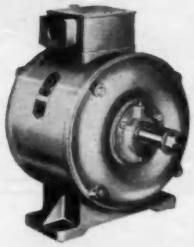
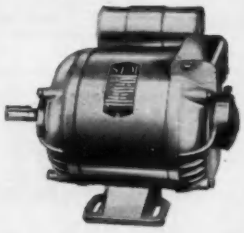


WE offer you a technical service of the highest quality.



WE are keen to tackle your problem, whether it be electrical or Electro-mechanical.

Let us demonstrate what we can do for YOU, and remember S.E.M. is at YOUR service.



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Battery-operated D.C. Traction Motors
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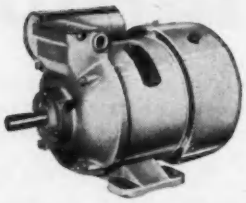
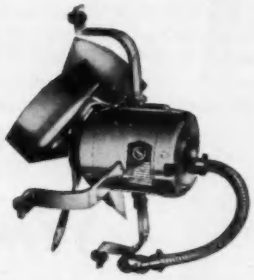


Contractors to all Government Departments.



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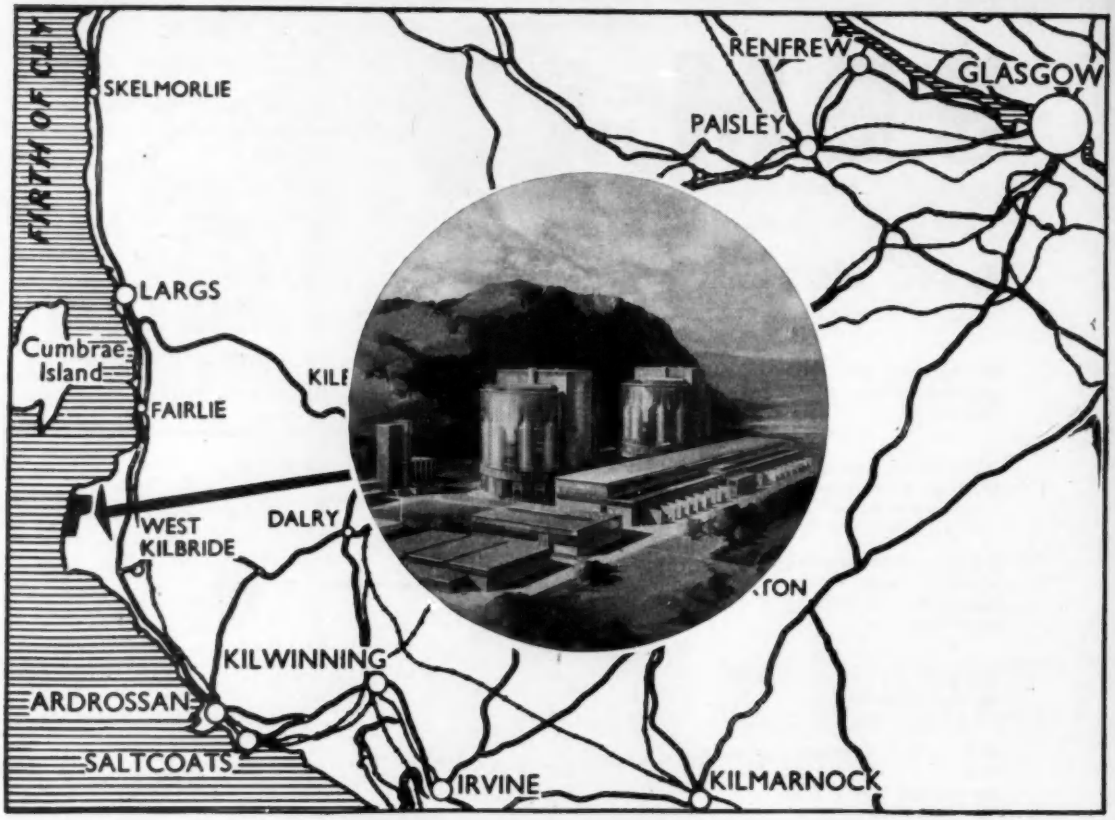
The Power of the Atom



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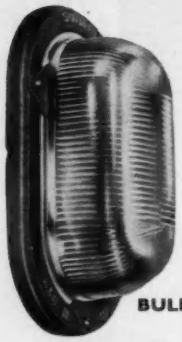

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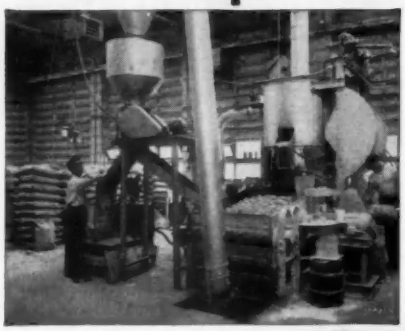

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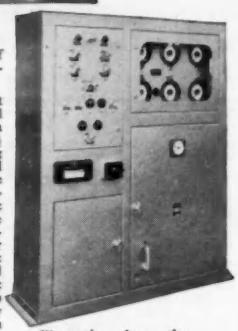

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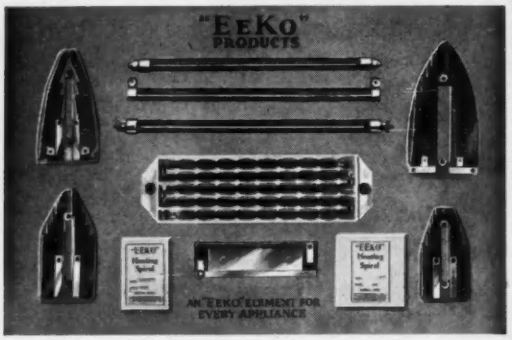

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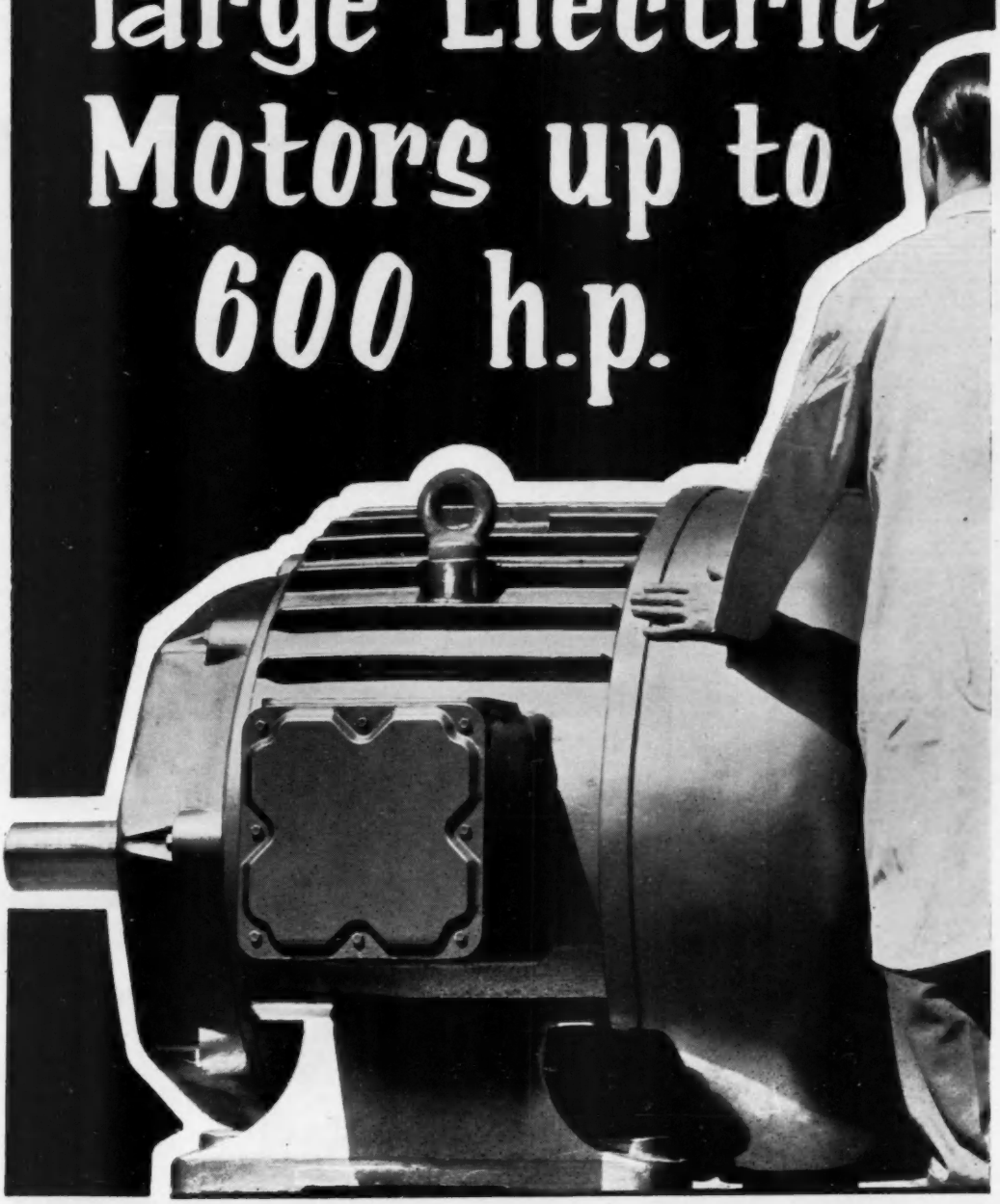
VINCENT PARADE · BIRMINGHAM · 12

BROOK for large Electric Motors up to 600 h.p.



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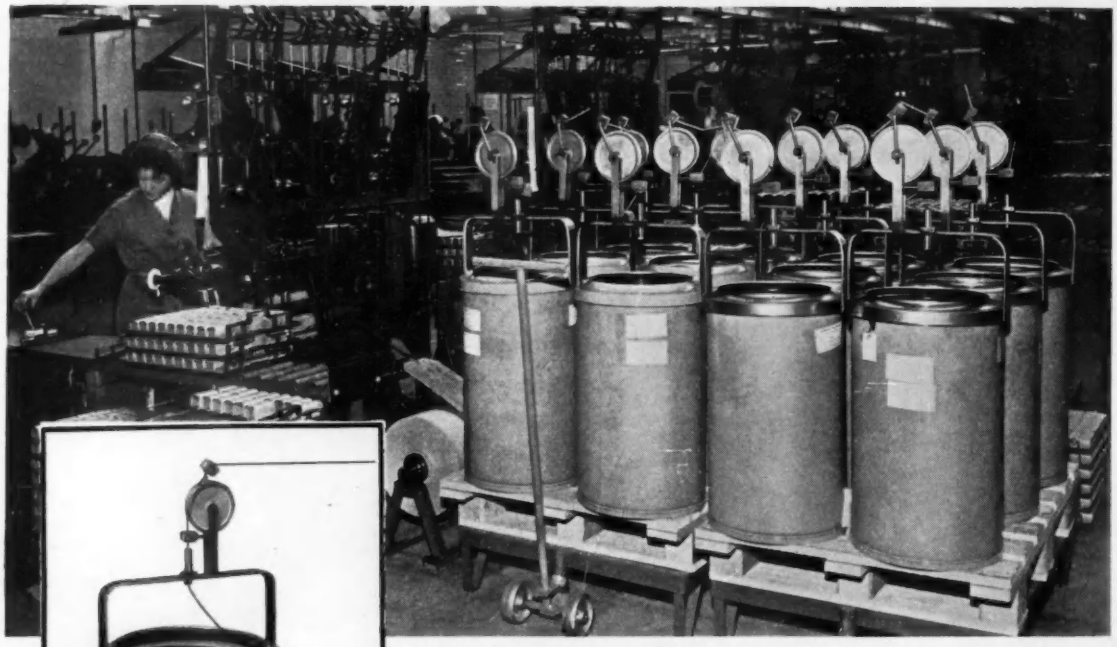

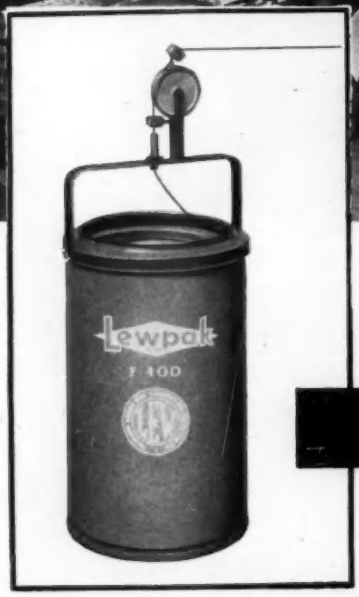

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ACTUAL SIZE

Z2 SERIES ZENER DIODES

±5% Voltage Tolerance (Red and Green Sleeves)		±10% Voltage Tolerance (Red and Yellow Sleeves)		±20% Voltage Tolerance (Red and Blue Sleeves)	
TYPE	NOM. VOLTAGE	TYPE	NOM. VOLTAGE	TYPE	NOM. VOLTAGE
Z2A33	3.3	Z2A33	3.3	Z2A33	3.3
Z2A36	3.6				
Z2A39	3.9	Z2A39	3.9		
Z2A43	4.3				
Z2A47	4.7	Z2A47	4.7	Z2A47	4.7
Z2A51	5.1				
Z2A56	5.6	Z2A56	5.6		
Z2A62	6.2				
Z2A68	6.8	Z2A68	6.8	Z2A68	6.8
Z2A75	7.5				
Z2A82	8.2	Z2A82	8.2		
Z2A91	9.1			Z2A100	10
Z2A100	10	Z2A100	10		
Z2A110	11				
Z2A120	12	Z2A120	12	Z2A150	15
Z2A130	13				
Z2A150	15	Z2A150	15		

Characteristics and ratings of *SenTerCel* Zener Diodes are given in publication SIL/103A

Standard Telephones and Cables Limited

Registered Office : Connaught House, Aldwych, London, W.C.2

RECTIFIER DIVISION

EDINBURGH WAY · HARLOW · ESSEX

BUILD UP SALES

with these

built-in *space heaters*

Built-in Ekco Thermovent Heaters are ingeniously designed to save space and provide efficient and safe heating in shops, offices, stores and in the home.
SPACE SAVING. The front panel projects only 1⅛" into the room and no special insulation to the recess is required.
THERMOSTATIC CONTROL. Room temperature can be quickly adjusted to any requirement with the easy-to-operate built-in Thermostatic Control. It reacts quickly to *the slightest* changes of temperature, thus improving the heater's efficiency and reducing running costs.
COMPLETELY SAFE. Thermovent Inset Heaters can be used anywhere in the home.

Recommend and sell these SPACE HEATERS for the space they save

Type 'B' inset model

Steel grille bars in 'old gold' enamel: plastics sections in walnut or black (other colours at slightly extra cost). Available in 1kW or 2kW loadings, with or without thermostatic control. From £13.7.8.

New Ekco Range

Ekco Heating Equipment now includes an excellent range of Radiant Fires and Electric Blankets. It is being supported by the 'biggest-ever' Ekco TV and Press publicity campaign.

EKCO

electric heating

E. K. COLE LTD · 5 VIGO ST · REGENT ST · LONDON · W.1

WILLIAM GEIPEL ESTD. 1871 LIMITED

CONTROL GEAR

A.C. and D.C.

for all Industrial purposes

STARTERS
DIRECT ON LINE
PUSH BUTTON
REVERSING
STAR DELTA

REGULATORS
RESISTANCES
RELAYS
CONTACTORS
SWITCHES
ETC.

A full range of Standard Equipment. Special Equipment designed and made to Customers' requirements.

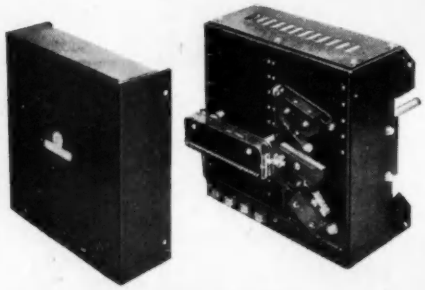
VULCAN WORKS · 156-170 BERMONDSEY ST · LONDON · S.E.1

JM

JOHN MORRIS

ELECTRICAL ENGINEERING CO. LTD.

BILSTON TEL. 41237-8 STAFFS



MECHANICALLY OPERATED

TENSION REGULATORS

used to control reeling motors in the Rubber, Steel and Paper Industries, etc.

Available with shaft extension for geared drives or operating lever for festoon regulation.

WE manufacture a wide range of standard Fluorescent Fittings for industrial and commercial application at very competitive prices.

We also specialise in the manufacture of Fittings to customers' individual requirements.

Send for our Broad Sheet to:

POSELCO LIMITED

254-256 WATFORD WAY, LONDON, N.W.4
Telephone: SUNnyhill 3462/3

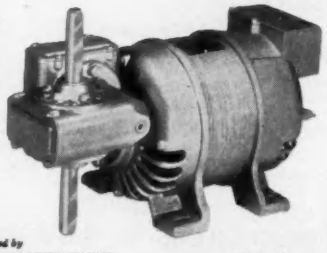
We specialise in

FHP Motors

Including Universal, Permanent Capacitor, Induction, Synchronous, Shaded Pole and Split Phase types. These motors are also available with Single or Double Reduction Worm Gear Boxes, with a range of speeds from ¼ r.p.m. up to 840 r.p.m.

Our latest catalogue available on request.

Illustration shows Parvalux S.D.20 Double Reduction Worm Gear Unit with Split Phase Induction motor. 1/8 h.p. with a range of final speeds from 0.2 to 19 r.p.m.



Designed and Manufactured by
REGD. TRADE MARK
PARVALUX
LIMITED
PARKSTONE POOLE · DORSET . ENGLAND

Telephone: Parkstone 3827 PBX
Telegrams: Parvalux, Parkstone

HYDE FOOT-OPERATED WIRE STRIPPER

Strips a wide range of insulated wires and small flexible cables up to ¼" outside diameter. Operating in one quick, effortless action, the stripper will not nick or damage wires.

HYDE E-Z WIRE STRIPPER

Used by hundreds of manufacturers, contractors and service agents. Precision stripping with the E-Z saves Wasting wire, prevents nicking and protects the user's fingers.

Stripping without teasing

HYDE BENCH-TYPE CABLE STRIPPER

Strips insulation from cables up to ¼" outside diameter, no splaying, no nicking, and one single movement does the whole job quickly and cleanly.

The days of clumsy stripping with knife or pliers have gone—the efficient, modern method is to use HYDE wire and cable strippers. Adjustable stops control lengths of strip. For greater production and perfect results without skill or experience, HYDE strippers are essential.

Obtainable from all good Tool Dealers or directly from the makers:

J. B. HYDE & CO. LTD.
Dale Street, Broadheath
ALTRINCHAM, CHESHIRE
Telephone: Altrincham 0842
Telegrams: "Braiding, Altrincham"

NEW Osram UNIVERSAL START

GUARANTEED TUBE

All OSRAM 5ft. 80W Guaranteed Tubes now have an unobtrusive but robust metallic stripe applied by an entirely new technique.

The OSRAM 5ft. 80W Universal Start tube (List price 13*s.* plus P.T.)—suitable for switch or switchless start circuits—means . . .

- Fewer types to stock
- Simplified ordering
- Lower installation and maintenance costs

Osram FOR PROGRESS & SUPERB QUALITY

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.

Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words) per insertion. Where an advertisement includes a Box Number there is an additional charge of 1/-.

DISPLAYED CLASSIFIED:—48/- per inch. Cheques and Postal Orders should be crossed and made payable to ELECTRICAL REVIEW PUBLICATIONS LTD.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

REPLIES to Box Numbers should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1, but if not to be delivered to any particular firm or individual they should be accompanied by instructions to this effect, addressed to the Manager of the ELECTRICAL REVIEW. Replies in such cases cannot be returned. The name of an advertiser using a Box Number will not be disclosed.

Advertisements are accepted up to first post on Monday of the week of issue

If displayed with boxed rules, name or symbol block by Friday prior to week of issue

All communications to be addressed to:
Classified Advertisement Department,
ELECTRICAL REVIEW
Dorset House, Stamford Street
London, S.E.1

Original testimonials should not be sent with applications for employment

OFFICIAL NOTICES, TENDERS, ETC.

BOROUGH OF RHONDDA

New Street Lighting

TENDERS are invited for the supply, delivery and erection of Group A Street Lighting Units complete with pre-stressed spun concrete columns and steel columns on approximately 7½ miles of classified roads in the Borough. Alternative tenders will be required for the following types of lighting, namely:—

(1) Complete Mercury Vapour Fluorescent.
(2) Complete Sodium Vapour.
(3) Combination of Mercury Vapour Fluorescent and Sodium Vapour.

Forms of tender, specification and bill of quantities may be obtained from Mr. A. H. Gillard, A.M.I.C.E., M.I.Mun.E., Borough Engineer and Surveyor, Municipal Offices, Pentre, Rhondda, on receipt of a stamped addressed envelope. Detail plans and general conditions may be inspected, by arrangement, at the Borough Surveyor's Office.

Tenders in envelopes provided and endorsed "Street Lighting" are to be delivered to the undersigned not later than Saturday, 29th November, 1958.

The Council do not bind themselves to accept the lowest or any tender.

E. D. WILDE,
Town Clerk.

Municipal Offices,
Pentre, Rhondda.
7th November, 1958. 5444

PARISH OF SPONDON

Trunk Road Lighting: Borrowash By-Pass

TENDERS are invited for the supply and erection of 6 Steel Columns, complete with 140-watt Sodium Lamp Cut-off Lanterns.

Specification, bill of quantities and form of tender may be obtained from the Clerk to the Council, on payment of a deposit of £2, which will be refunded on receipt of a bona fide tender.

Tenders to be returned in plain sealed envelopes, endorsed "Trunk Road Lighting," to the undersigned not later than 24th November, 1958.

MRS. E. A. ARMETT,
Clerk to the Council.

130, Locke Road,
Spondon, Derbyshire. 5418

CORPORATION OF THE CITY OF ABERDEEN

Lighting Department

TENDERS are invited for the supply of Electric Lamps to the Aberdeen Corporation Lighting Department during the year 1959. Tender forms and details may be obtained from the Superintendent of Lighting, 262, King Street, Aberdeen, to whom tenders should be submitted on or before 1st December, 1958.

J. C. RENNIE,
Town Clerk.

Town House,
Aberdeen.
7th November, 1958. 9537

CITY OF MANCHESTER

Davyhulme Sewage Works Extensions: Stage 1A

TENDERS invited for supply and installation of Road Lighting Standards and Lamp Fittings and Floodlighting Standards and Fittings.

Tender documents, obtainable from City Surveyor, Town Hall, Manchester, 2, returnable by 26th November, 1958. 5411

BOROUGH OF KETTERING

Street Lighting: Trunk Road A.6

TENDERS are invited for the provision of 22 400-watt Mercury Vapour and 33 3 × 80-watt Fluorescent Lighting units on Steel Columns in connection with the improved lighting of a section of Trunk Road A.6.

Tenderers may quote for:—

(a) The supply only of lanterns, auxiliary gear and lamps.
(b) The supply of columns with erection, wiring and fitting of electrical equipment supplied by another firm.
(c) The whole of the work.

General conditions of contract and plans may be inspected, and specification, bills of quantities and forms of tender obtained from the Borough Engineer and Surveyor's Office, 3, Gold Street, Kettering, on payment of a deposit of £2 2s., which will be refunded on receipt of a bona fide tender and the return of all documents.

Tenders in plain sealed envelopes endorsed "Lighting Scheme, Trunk Road A.6" must be delivered to the undersigned not later than noon on Friday, 28th November, 1958.

The Council do not bind themselves to accept the lowest or any tender.

D. DUNSFORD PRICE,
Town Clerk.

Council Offices,
High Street, Kettering.
28th October, 1958. 5350

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

Strathfarrar and Kilmorack Transmission

TENDERS are invited for the construction of a 132-kV Double Circuit Steel Tower Transmission Line, approximately 15 miles route length, between Beauly and Deannie, Inverness-shire.

Tender documents may be obtained from the Engineers, Messrs. Kennedy & Donkin, 12, Caxton Street, London, S.W.1, on receipt of £2 2s. deposit (returnable).

The Board do not bind themselves to accept the lowest or any tender. 5457

CITY OF MANCHESTER

Davyhulme Sewage Works Extensions: Stage 1A

TENDERS invited for supply and installation of Works Telephone Equipment.

Tender documents, obtainable from City Surveyor, Town Hall, Manchester, 2, returnable by 26th November, 1958. 5410

SITUATIONS VACANT

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

STATION SHIFT CONTROL ENGINEER is required at Hams Hall "C" Power Station, Lea Marston. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade K.10, £935 - £995 per annum plus 10% for shift duties.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 887MD, on form AE6. available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 27th November, 1958. 5428

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

BRIGHTON "A" POWER STATION
ASSISTANT ENGINEER (Instruments). Applicants should possess a Higher National Certificate and must be experienced in maintenance testing and calibration of all types of power station instruments. Salary Class H, Grade 9, £885-£930 per annum.

LITTLEBROOK POWER STATION
ASSISTANT ENGINEER (Efficiency). Applicants should have had experience in power station operation and in particular experience in P.F. pillar operation. H.N.C. (Mechanical) desirable. Salary Class L, Grade 11, £985-£1,045 per annum including London allowance.

ASSISTANT SHIFT CHARGE ENGINEER. Experience of operation of high pressure power station plant is essential and possession of H.N.C. preferred. Salary Class L, Grade 8, £1,326-£1,408 10s. per annum including London and Shift allowances.

CROYDON "B" POWER STATION
ASSISTANT ENGINEER (Efficiency). Applicants, who should preferably possess H.N.C. in Mechanical and/or Electrical Engineering or equivalent qualification, must have had extensive experience in the testing and efficient operation of large high pressure plant. P.F. experience an advantage. Salary Class J, Grade 7, £1,115-£1,190 per annum including London allowance.

STATION SHIFT CONTROL ENGINEER. Candidates should have had experience in the operation/control of large turbo-alternators and high voltage switchgear. Possession of H.N.C. and knowledge of electrical protection systems preferred. Salary Class J, Grade 10, £1,023 10s.-£1,073 per annum including London and Shift allowances.

N.J.B. conditions of service. Applications giving details of education, age, present position, experience, etc., should be sent to the Station Superintendent, according to location of vacancy at Brighton "A" Power Station, Portslade-by-Sea, Sussex; Littlebrook Power Station, near Dartford, Kent; or Croydon Power Station, Beddington Farm Road, Croydon, Surrey, so as to arrive by 21st November, 1958. 5470

POWER PLANT ENGINEER

required by the UNITED KINGDOM ATOMIC ENERGY AUTHORITY, Industrial Group, at Chapelcross Works, Annan, Dumfriesshire, Scotland, to assist on day duty with calculations, planning and operational work on the power plant which consists of steam raising heat exchangers, steam turbines and their auxiliaries, and the station electrical system. This provides an excellent opportunity to gain experience of the operation of a nuclear power station.

A recognised engineering apprenticeship and corporate membership of a senior engineering institution, or equivalent, are essential. Experience in a conventional power station would be an advantage.

Salary between £815 (at age 25) and £1,270.

Contributory pension scheme.

There is a staff housing scheme.

Send postcard for application form, quoting reference 2734, to Works Secretary, at above address.

Closing date 24th November, 1958. 5417

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS invited for following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or B. Salary includes London allowance. Qualifications entitling to Graduate Membership of I.E.E. or I.Mech.E. for posts (a) and Corporate Membership for post (b) an advantage.

(a) STATION SHIFT CONTROL ENGINEER, BANKSIDE POWER STATION (Vacancy No. 58/922).

Sound engineering training with experience in control and operation of steam generating plant and main switchgear in modern power station. Salary Class H, Grade 10 = £885 plus £83 10s. shift p.a.

(a) ASSISTANT MAINTENANCE ENGINEER (Electrical), DEPTFORD WEST POWER STATION (Vacancy No. 58/923).

Experience in maintenance of power station H.T. and L.T. electrical apparatus, with ability to supervise staff. Salary Class J, Grade 9 = £985 p.a.

(a) SHIFT CHARGE ENGINEER, POPLAR POWER STATION (Vacancy No. 58/924).

Sound technical training with experience of chain grate and water-tube boiler operation, together with character and ability to supervise staff. Salary Class E, Grade 7 = £885 plus £83 10s. shift p.a.

(a) STATION SHIFT CONTROL ENGINEER, WEST HAM POWER STATION (Vacancy No. 58/925).

Applicants should have a sound technical training and practical experience in the control and operation of steam generating plant and main switchgear in a modern power station. Salary Class H, Grade 10 = £885 plus £83 10s. shift p.a.

(b) OPERATION SUPERINTENDENT, WOOLWICH POWER STATION (Vacancy No. 58/926).

Applicants should have had a comprehensive experience of modern power station operation, together with character and ability to supervise staff. Salary Class H, Grade 5 = £1,210 per annum.

(a) STATION SHIFT CONTROL ENGINEER, WOOLWICH POWER STATION (Vacancy No. 58/927).

Applicants should possess good technical qualifications and have had sound technical training and practical experience in the control and operation of steam generating plant and switchgear. Salary Class H, Grade 10 = £885 plus £83 10s. shift p.a.

(a) THIRD ASSISTANT ENGINEER, OPERATIONAL RESEARCH SECTION, DIVISIONAL H.Q. (Vacancy No. 58/928).

Candidates should be qualified engineers with some training and experience in generation side of supply industry. Training in method study and operational research techniques will be provided. Salary Class AX/EX, Grade 6 = £945/£1,190 p.a.

(Applicants to Vacancy 58/754, issued 17th September, 1958, need not re-apply as they will be reconsidered.)

Applications, quoting vacancy number, to (or on form from) Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 24th November, 1958. 5427

ELECTRICAL CONTRACTORS' MANAGER, LONDON

APPLICATIONS are invited for this SENIOR POSITION by nationally known Company. Applicants should have experience with electrical contracting firm of estimating and supervision of contracts; ability is required in handling staff, general administration and in meeting executives; some commercial experience an advantage. Excellent salary and prospects in rapidly growing organisation; generous superannuation.

Apply stating age, experience and any technical qualifications to—Box 5477.

ROLLS-ROYCE

(Aero Division)

ROLLS-ROYCE LIMITED, Aero Engine Division, require an additional

SHIFT CHARGE ENGINEER

for operating electro-mechanical plant to be used for altitude testing of aero gas turbine engines at Derby.

The installation comprises six 20,000-h.p. motor compressor sets, cooling and regeneration turbines, large heat exchangers, refrigeration plant, cooling towers, electro-hydraulic and pneumatic control systems and other ancillary services. The total installed h.p. is 150,000, with a supply voltage of 33,000 v.

Applicants should have sound technical training and practical experience in the operation of this type of equipment. Appropriate technical qualifications would be an advantage.

The appointment carries a basic salary of £1,085 per annum, which is progressive, in addition to which there is a shift allowance.

Applications will be treated in the strictest confidence, and those selected for interview could be seen either in Derby or elsewhere as convenient.

Candidates should write for an application form to :—

The Manager
Technical Administration (GS)
Aero Division
ROLLS-ROYCE LIMITED
P.O. Box 31, Derby

5354

NORTH EASTERN ELECTRICITY BOARD

Harrogate Sub-Area

Sub-Area Commercial Officer

APPLICATIONS are invited for the appointment of SUB-AREA COMMERCIAL OFFICER at Sub-Area Headquarters, Harrogate.

Applicants should have had wide experience of commercial practice and distribution in electricity supply, including development work in urban and rural areas.

Salary in accordance with N.J.M. and H.E. Grades Agreement, Class A, Grade 5, £1,500/£1,700 per annum.

Applications stating age, qualifications and experience, and naming two persons to whom reference could be made, should be marked "Confidential" and be received by the Assistant Secretary (Establishments), North Eastern Electricity Board, Carliol House, Newcastle upon Tyne, 1, within ten days of the appearance of this advertisement. 5422

WEST RIDING COUNTY COUNCIL

Castleford Whitwood Mining and Technical College

Engineering Department

APPLICATIONS are invited for the post of LECTURER in Electrical Engineering to be generally responsible for the electrical course work and laboratories in the College for O.N.C. Electrical Engineering, Mining and Mining Electrical Engineering, General Mining Electrical Engineering, H.N.C. in Mining courses.

Applicants should possess graduate qualifications and have had suitable industrial and lecturing experience.

Salary in accordance with Burnham Technical Report. £1,200 × £30 to £1,350.

Application forms and further particulars obtainable from the Clerk to the Governors, 2, Wesley Street, Castleford. 5432

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following appointments in this Division :—

SHIFT CHARGE ENGINEER, BURTON-ON-TRENT POWER STATION (Vacancy No. 164/58/ER).

A sound technical training and practical experience in the control and operation of steam generating plant and main switchgear are required. Appropriate qualifications an advantage.

Salary will be within Class E, Grade 7 (£835-£880 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 19th November, 1958.

PLANT SHIFT CONTROL ENGINEERS, CASTLE DONINGTON POWER STATION (Vacancy No. 167/58/ER).

Experience desirable in control of boilers and turbines at high pressure and temperature, pulverised fuel, together with electrical control room experience.

Technical qualifications to Higher National Certificate desirable.

Salary will be in accordance with Class L, Grade 10 (£995-£1,055 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 26th November, 1958.

SHIFT CHARGE ENGINEER, DERBY POWER STATION (Vacancy No. 170/58/ER).

Applicants should have had a sound technical training and considerable experience in a modern power station. Preference will be given to candidates who are Graduate Members of the Institution of Electrical or Mechanical Engineers, or who hold similar qualifications. A knowledge of pulverised fuel firing will be an advantage.

Salary will be within Class F, Grade 7 (£885-£930 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 26th November, 1958.

These appointments will be pensionable under the terms of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. PLEASE QUOTE VACANCY NUMBER.

O. S. WOODS,
Divisional Controller.

5th November, 1958. 5443

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

North Caledonia Area

APPLICATIONS are invited for the following superannuable posts:—

SECOND ASSISTANT DISTRICT ENGINEER (Dufftown).

SECOND ASSISTANT DISTRICT ENGINEER (Grantown-on-Spey).

The successful applicants will be required to assist in the construction and maintenance of high voltage and low voltage overhead lines, underground networks and substations. Special knowledge of overhead line work would be an advantage. Technical qualifications, Higher National Certificate or equivalent.

Salary £885/£930 per annum (N.J.B. E6).

GENERAL ASSISTANT DISTRICT ENGINEER (Fraserburgh).

Applicants should have some knowledge of the electricity supply industry and practical experience would be an advantage. Technical qualifications, Ordinary National Certificate or equivalent.

Salary £635/£680 per annum (N.J.B. E11).

Application forms may be obtained from the Area Manager, to whom the completed forms must be returned not later than 27th November, 1958.

A. MENZIES,
Area Manager.

West Villa,
Elgin,
Morayshire. 5461

CITY OF SALISBURY, SOUTHERN RHODESIA

Electricity Department

Vacancy for Electrical Engineers, Grade 1, Salary Scale £1,575 × £50 to £1,725 p.a.

APPLICATIONS are invited for the position of ELECTRICAL ENGINEER GRADE 1 on the salary scale £1,575 × £50 to £1,725 p.a., commencing salary at the minimum of the grade. No cost-of-living or other allowances are payable.

Candidates should possess a Degree in Electrical Engineering or the equivalent, and/or be Corporate Members of the British Institution of Electrical Engineers, and have had at least 15 years' experience in the design, erection and maintenance of indoor and outdoor substations, transformers, switchgear, protection, etc., up to and including 33,000 volts. Experience on 88-kV equipment will be an advantage.

The position is a senior post and the selected candidate will be in charge of the substation section of the Distribution Department of an undertaking covering approximately 600 square miles and some 950 substations, with a present system maximum demand of 110 MW; experience in general distribution work and in the control of staff in an organisation of similar size is essential.

The appointment will be subject to the Council's Service and Leave Regulations as amended from time to time. The successful applicant will be required to submit a satisfactory medical certificate of fitness and to serve a probationary period of six months. He must also be able to comply with the requirements of the Immigration Authorities.

Applicants are requested to submit full particulars of their qualifications, training and experience, giving details of positions held and salaries received, marital state, age, place of birth, and nationality. Copies of not more than three recent testimonials may be included.

Further particulars, including a summary of conditions of service, leave entitlement, allowances towards travelling and removal expenses, etc., are obtainable from Davis & Soper Ltd., 52-54, St. Mary Axe, London, E.C.3, to whom applications must be submitted on or before 5th December, 1958. 5353

CITY OF BIRMINGHAM PUBLIC WORKS DEPARTMENT

Mechanical and Electrical Section

APPLICATIONS are invited for the following posts in the Design Office :—

(a) PRINCIPAL ASSISTANT ENGINEER (Mechanical, Heating and Ventilating), Scale A (£1,255/£1,420 p.a.).

(b) CHIEF ASSISTANT ENGINEER (Electrical), A.P.T. V (£1,175/£1,325 p.a.).

(c) SENIOR ENGINEER (Heating and Ventilating), A.P.T. IV (£1,025/£1,175 p.a.).

(d) ASSISTANT ENGINEER (Heating and Ventilating), Special Grade (£750/£1,030 per annum).

Applicants must be Associate Members of the Institution of Mechanical, Electrical or Heating and Ventilating Engineers, or hold the Higher National Certificate in Mechanical or Electrical Engineering (with five years' experience).

Duties undertaken in this office include the design of mechanical, electrical and heating services and installations in civic buildings, municipal offices, multi-storey flats and other dwellings, car parking garages, fire and police stations, schools, baths, salvage destructor plants, pumping stations, etc.

Applicants must have had experience in the design, specification and supervision of contracts associated with the above work.

The appointments are permanent, superannuable, subject to a medical examination, and terminable by one month's notice on either side.

Applications, endorsed with the heading of the post applied for, stating qualifications, age and experience, together with the names of two persons to whom reference may be made, should reach the undersigned not later than 13th December, 1958.

Canvassing disqualifies.

HERBERT J. MANZONI,
City Engineer and Surveyor.

Civic Centre,
Birmingham, 1. 5447

ASSISTANT STEAM SERVICES ENGINEER

Owing to expansion within the Company an ASSISTANT STEAM SERVICES ENGINEER is required by the Steel Company of Wales Limited (Steel Division), in their Power Plant Department.

Applicants must be thoroughly experienced with all aspects of low pressure boiler operation, and have some knowledge of steam distribution systems. Their duties will also include technical investigations, plant testing and the direct supervision of extensive operation and maintenance sections.

Candidates must be able to produce evidence of an advanced technical education.

Those wishing to apply should write giving full details of age, experience, present salary and any further information considered relevant to :—

Superintendent, Personnel Services
THE STEEL COMPANY OF WALES LIMITED
(Steel Division)
Abbey Works, Port Talbot

5442

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:—

North Staffs Sub-Area

FOURTH ASSISTANT ENGINEERS (two) (for shift duties in the Stoke-on-Trent Common Service Control Centre, The Parkway, Hanley).

The successful applicants will be required to assist the distribution shift control engineer in the operation of the sub-area transmission and distribution system. Applicants should have a knowledge of system operation and loading. Experience in generation and the operation of supervisory controlled substations would be an advantage. Technical qualifications desirable. Salary £835/£880 per annum (N.J.B. Grade L.13).

Apply by letter within 14 days, stating age, experience, present salary and position, to Sub-Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

Shropshire and Herefordshire Sub-Area

SECOND ASSISTANT DISTRICT COMMERCIAL ENGINEER (Hereford). Applicants should have had a sound technical training and wide practical experience in the sale and installation of domestic and commercial electrical equipment and the work associated therewith. The successful applicant will be required to assist in all branches of commercial work, including advising consumers on domestic, commercial, and industrial equipment, estimating, and contracting work. Technical qualifications desirable. Salary £835/£880 per annum (N.J.B. Grade F.8).

Apply by letter within 14 days, stating age, experience, present position and salary, to Mr. W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

A. STEPHENS,
Secretary.

5471

SOUTHERN ELECTRICITY BOARD

Assistant Engineer (Planning)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class E, Grade 9 (£740 × £15 to £785 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground h.v. and l.v. networks. Applicants should have had sound experience in electricity supply distribution, and the possession of suitable technical qualifications would be an advantage. The person appointed will be required to carry out standby duties if and when called up to do so.

The successful candidate for the above appointment will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him quoting Z.950, in envelopes suitably endorsed, not later than 24th November, 1958. 5489

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

THIRD ASSISTANT ENGINEER, POOLE TECHNICAL AREA (SEC/3.1).

Applications are invited for the above mentioned position in the Poole Area of the Technical Engineer's Department.

The successful applicant will deal with the commissioning and maintenance testing of electrical control and protective equipment associated with high power generation and main transmission plant (E.H.V. switchgear and transformers).

Applicants should have received a sound technical education and preference will be given to those who are corporate members of a senior professional engineering institution or who hold qualifications leading to corporate membership.

Salary N.J.B. AX/DX, Grade 5, £1,055-£1,285.

MAINTENANCE ENGINEER (Electrical), PORTSMOUTH GENERATING STATION (SEC/3.2).

Applicants should have had considerable experience in the maintenance of generating station electrical equipment and must be capable of controlling staff, and planning and supervising electrical plant maintenance. They should be corporate members of an appropriate professional institution or hold qualifications leading to corporate membership.

Salary N.J.B. G/7, £935-£995.

Special application forms for each position obtainable only from P. D. A. Oliver, Divisional Secretary, Central Electricity House, High Street, Portsmouth, should be returned by 26th November, 1958. 5469

JOSEPH LUCAS (ELECTRICAL) LIMITED

Great King Street, Birmingham, 19

ENGINEER

EXPANSION of development of ignition equipment for gas turbines and allied projects creates a vacancy for a practical engineer with experience of design for economic production of electrical apparatus. The work is of a high technical standard and applicants should preferably possess an honours degree.

The post is permanent and pensionable and offers considerable scope for advancement to a progressive engineer.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Ltd., Great King Street, Birmingham, 19, quoting reference PM/D/190.

128

Situations Vacant (continued)

YORKSHIRE ELECTRICITY BOARD

Head Office

SECOND ASSISTANT ENGINEER (Hull West Control Centre). A Senior Control Engineer is required for the Hull West Control Centre which will be established during 1960.

Applicants should be Corporate Members of the Institution of Electrical Engineers and should preferably have had field operational experience on overhead and underground systems; previous experience in a control room is desirable.

The Control Centre, which will be situated at Hessle, will control the Hull, East Riding and North Lincolnshire areas.

Salary N.J.B. Schedule B, Class AX-EX, Grade 4, £1,145/£25/£1,270 rising to £1,410 per annum.

Applications, quoting H.O.R., and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Secretary, Yorkshire Electricity Board, Wetherby Road, Scarcroft, near Leeds, not later than 28th November, 1958.

No. 6 (Hull) Sub-Area

HULL DISTRICT

FOURTH ASSISTANT DISTRICT ENGINEER (Commercial). Applicants must have a good general and technical education and have had actual workshop experience in electrical and mechanical practice.

The successful applicant will be responsible for the estimating for and the repair and reconditioning of all types of commercial and domestic equipment—both electrical and mechanical; and the clearing of technical records appertaining to this work.

Candidates must hold at least the Ordinary National Certificate in Electrical Engineering, or equivalent qualifications.

Salary N.J.B. Class J, Grade 11, £835/£15/£880 per annum.

Applications, quoting 6 SAR, and giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 28th November, 1958. 5460

RAILWAY SIGNALLING

METROPOLITAN-VICKERS ELECTRICAL CO. LTD.

require

ENGINEERS

for work on signals, track apparatus, relays, relay racks, control panels, remote control systems, automatic train control, automatic control of marshalling yards, etc.

Although previous experience of this type of work is not essential, it would be an advantage for applicants to be familiar with modern railway signalling apparatus.

The minimum engineering qualification required is the Higher National Certificate.

These posts, which are pensionable, are based on the company's Trafford Park factory.

Applications, quoting F.12, should be sent to :—

Personnel Manager
METROPOLITAN-VICKERS ELECTRICAL CO. LTD.
Trafford Park, Manchester, 17

5356

DORMAN LONG (STEEL) LTD.

require a working

CHARGEHAND ARMATURE WINDER

at their new Lackenby Works, having sound knowledge of all A.C. and D.C. windings, including equipment used in steelworks, and rolling mill drives up to 8,000 h.p.

Send fullest details to LABOUR OFFICER, LACKENBY WORKS, GRANGETOWN, MIDDLESBROUGH. 80

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Area Headquarters, Wherstead
(118/58.R)

PURCHASING OFFICER. Candidates must be familiar with distribution plant and equipment and have an intimate knowledge of the electrical manufacturing industry. They should have had extensive experience of negotiating with suppliers. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary N.J.M. Class C, Grade 8 (£2,500-£2,700).

Apply by letter to the Chief Engineer, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk, by 28th November, 1958.

Chilterns Sub-Area Headquarters
(115/58.R)

SENIOR ASSISTANT ENGINEER (Planning and Development). Candidates should have had a sound technical training and wide experience of the planning, design and development of underground and overhead distribution systems up to and including 33 kV, and all associated matters. Corporate Membership of the Institution of Electrical Engineers would be an advantage.

Salary N.J.B. Class L, Grade 3 (£1,685-£1,790).

Apply by letter to S. F. C. Whitmore, A.M.I.E.E., Manager, Chilterns Sub-Area, Eastern Electricity Board, Prebend Street, Bedford, by 21st November, 1958. 5472

ROYAL NAVAL SCIENTIFIC SERVICE

SENIOR SCIENTIFIC OFFICERS and SCIENTIFIC OFFICERS required for establishments in London area, Baldock, Portsmouth, Portland, Poole, Greenock and Rosyth. Main requirements are about 25 vacancies for PHYSICISTS, ELECTRONIC ENGINEERS and MATHEMATICIANS in areas specified.

The following particular vacancies also exist: MECHANICAL ENGINEER for work on gas turbine problems in the London area. MECHANICAL ENGINEER for work on design and development of U/W devices in Portland area. METALLURGISTS for Rosyth and Poole. CHEMISTS (Physical and Inorganic) for Poole area, Baldock and London.

Candidates must normally be natural-born British subjects of natural-born British parents, with at least First or Second Class Honours degrees or equivalent high professional attainments. S.S.O.s must have had at least three years' postgraduate experience and be not less than 26 years of age.

Salaries (men): S.S.O. £1,190-£1,410; S.O. £635-£1,110 (London); somewhat lower in Provinces. Appointments unestablished (with F.S.S.U. benefits), but opportunities may occur for those between ages of 21 and 32 to compete for established posts.

Forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, London, S.W.1, quoting A98/8A. 5164

PILKINGTON BROTHERS LIMITED

require an

ELECTRICAL ENGINEER

to take charge of the power frequency section of a large high-voltage laboratory. Voltages up to 1,300 kV are available. An extensive programme of research and development is in progress.

A University Degree is required, with preferably some experience of high-voltage laboratory work. The preferred age range is 25-30.

Applications, stating age, qualifications, experience and present salary, should be addressed to :—

Personnel Officer (Graduate Recruitment), Pilkington Brothers Limited, St. Helens, Lancs.

5434

JOSEPH LUCAS (ELECTRICAL) LIMITED

ASSISTANT ELECTRICAL DESIGN ENGINEER

required for the design of rotating electrical machines and electro-magnetic devices. Projects will include fundamental design investigations, and full scope will be given for initiative and imagination.

The post is permanent and pensionable.

Apply in writing stating age, qualifications and experience to the Personnel Manager, Joseph Lucas (Electrical) Limited, Great King Street, Birmingham, 19, quoting reference PM/D/221.

125

AIR MINISTRY

STATION ENGINEERS (G.D.) and STATION ENGINEERS (Mech.) required at R.A.F. and M.T.C.A. stations. Qualifications required : (a) O.N.C. Elec. or Mech. or equivalent; (b) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute; (c) 3 years' employment in electrical or mechanical engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference given to candidates with supervisory experience subsequent to (b) and (c).

Work consists of installation, operation and maintenance of high and medium-voltage electrical distribution system electrical installation, generating plant, steam and hot water heating systems and miscellaneous works plants, tools and equipment.

Commencing salary according to age, qualifications and experience on range £655-£820. Promotion and pensionable prospects and opportunities for overseas tours for which special allowance payable in addition to higher salary.

Applications normally from natural-born British subjects only, up to age 45 years. Write giving age, full details of qualifications and experience, quoting (PE.3140), to Manager, Ministry of Labour and National Service, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. 398

ASSISTANT POWER STATIONS SUPERINTENDENT

required by TEXACO TRINIDAD, INCORPORATED, for two power stations with a combined installed capacity of 23,000 kW, and associated steam, compressed air and water-treating plant, at their oil refinery in the West Indies.

Applicants should preferably be A.M.I.Mech.E., aged 30-35 years, and have at least 7 years' experience of the operation of modern turbo-generators and gas and oil-fired boilers.

Salary will be not less than £1,400 per annum, and subsidised accommodation and schooling for children are available.

Please write with brief particulars to the—

Personnel Officer
TRINOIL (U.K.) LIMITED
Trinidad House
Old Burlington Street, London, W.1

5473

OVERHEAD LINESMEN

OVERHEAD LINESMEN and CHARGEHAND OVERHEAD LINESMEN required in South Wales area. Write stating age, and giving details of previous experience to—Box 5416.

EAST MIDLANDS ELECTRICITY BOARD

Assistant (Commercial), Boston District, Lincolnshire Sub-Area

APPLICATIONS are invited for the position of ASSISTANT (Commercial) in the Boston District.

Applicants should have sound experience in the operation of a district commercial organisation, with particular reference to negotiations for new and additional supplies in a predominantly rural district, also public lighting and the records and statistics associated with this work. Applicants should have a general knowledge of tariffs and sales of apparatus. Experience of installation work is desirable but not essential.

The salary will be in accordance with Grade 3 (£720 × £20 to £780 per annum) of the National Joint Council Agreement of the Electricity Supply Industry.

The successful applicant will be based on the District Office at Boston and should be able to drive a motor vehicle.

Applications in own handwriting should be addressed to the Manager, Boston District, East Midlands Electricity Board, Besco House, 22, Market Place, Boston, Lincolnshire, so as to reach him within fourteen days of the issue of this advertisement. 5446

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Division

Second Assistant Station Chemist, Dunston "A" and "B" Power Station

APPLICATIONS are invited for the appointment of SECOND ASSISTANT STATION CHEMIST at Dunston "A" and "B" Power Stations.

Applicants should possess at least a Higher National Certificate in Chemistry. A knowledge of boiler and feed water treatment is desirable but not essential.

The successful candidate will be expected to assist the Station Chemist with the routine control work and with the investigation work in the laboratory and on the plant.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule A, Grade 11, Class K (£885-£930 per annum).

Forms of application may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned not later than 25th November, 1958. 5420

ASSISTANT WORKS MANAGER

required by a progressive electrical engineering organisation in the West of Scotland. The vacancy will appeal to a man with a sound basic and technical education, with experience in executive management, and who is looking for a first-class opportunity where he will rise and be rewarded on the results he produces in a virile and progressive organisation.

The intention is that he will be promoted to Works Manager as early as possible. A salary will be paid commensurate with this post and qualifications held, which should be a Higher National Certificate or the equivalent. The preferred age is 35-45 years.

Applications, which will be treated as absolutely confidential, should be sent to the Personnel Officer.—Box 5474.

WHIPP & BOURNE LTD.

ESTIMATING ENGINEERS required having experience of L.V. switchgear. Contributory pension scheme in operation.

Apply in writing only, giving details of age, experience and present salary, to :—

WHIPP & BOURNE LTD.
Switchgear Works
Castleton, Rochdale

5441

DUDLEY AND STAFFORDSHIRE TECHNICAL COLLEGE

Lecturer in Electrical Engineering

APPLICATIONS are invited for the appointment of LECTURER IN ELECTRICAL ENGINEERING, duties to begin on 1st January, 1959, or as soon as possible afterwards. Candidates should be University Graduates and preferably Corporate Members of the Institution of Electrical Engineers. Good industrial experience is required, as well as teaching experience. Ability to teach Power and Distribution up to H.N.C. standard is desirable.

Salary scale £1,200 × £30 to £1,350.

In fixing the salary account may be taken of industrial and professional experience up to the maximum of the scale.

Application forms and further particulars may be obtained from the Principal, Dudley and Staffordshire Technical College, Dudley, to whom the completed forms must be returned not later than 20th November, 1958.

A. W. GIBSON,
Principal. 5431

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

GENERAL ASSISTANT ENGINEER is required at Stourport "A" and "B" Power Stations for generation operation duties. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K14, £740-£785 per annum. An additional 10% of basic salary is payable when engaged on shift duties.

The appointment is permanent with excellent opportunities for advancement. It is necessary that applicants should have received a sound technical training and should preferably have had some industrial engineering experience and have as a minimum qualification the Ordinary National Certificate.

Apply quoting vacancy number 889MD on form AE6 available from the Establishments Officer, Central Electricity Generating Board, 53, Wake Green Road, Moseley, Birmingham, 13, by 1st December, 1958. 5465

M.K. ELECTRIC LIMITED

REQUIRE EXPERIENCED SALES

REPRESENTATIVE

FOR CENTRAL AND WEST LONDON

If you have experience in dealing with architects, electrical wholesalers and contractors, are a car owner and would like to join the sales team of a progressive company marketing products with a world-wide reputation, we would like to hear from you in confidence.

Write in the fullest detail to:—

The Sales Manager
M.K. ELECTRIC LTD.
London, N.18

5392

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER required in the Technical Department at No. 1 Sub-Area Headquarters, Liverpool. Salary will be within the range £835/£880 per annum (N.J.B. L/13).

Applicants should have had experience in the testing and commissioning of protective systems and associated equipment. Experience in the localisation of faults on h.v. systems would be an advantage.

Appointment subject to medical examination. Pension scheme.

Special application forms, obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be completed and returned not later than 26th November, 1958. 5458

A SENIOR POSITION

exists in the Sales Dept. of a large firm manufacturing electric motors. The position offers exceptional prospects for advancement. Good theoretical and practical training and subsequent sales experience essential. Preferable age 30 to 35. Apply in confidence stating age, experience, qualifications and salary.—Box 5448.

CENTRAL ELECTRICITY GENERATING BOARD

SECOND ASSISTANT ENGINEER required in the SYSTEM DESIGN AND DEVELOPMENT SECTION at Headquarters, London, S.E.1, for duties concerned with the preparation of designs for system reinforcement projects entailing appraisal of the technical and economic aspects, analytical studies, and initiation of schemes and submission of reports.

Candidates should possess a recognised qualification in electrical engineering and a University Degree would be an advantage. They should have had a sound technical training, and experience in the construction and/or operation of high voltage transmission systems. Experience in the design and layout of such systems would be an asset.

Salary within scale £1,210-£1,570 p.a.

Application form obtainable from I. G. Ellis, Personnel Officer, 24-30, Holborn, London, E.C.1, should be completed and returned by 27th November. Please mark envelope "Confidential, ref. E.R./342." 5464

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
Vacancy No. 118/ER/58

APPLICATIONS invited for superannuable N.J.B. appointment of FOURTH ASSISTANT ENGINEER in the CONSTRUCTION SECTION, TRANSMISSION SECTION, based at Neath.

Salary AX/DX.8 (£710-£910 per annum) or AX/DX.7 (£810-£1,010 per annum), according to qualifications and experience.

Applicants should possess H.N.C. (Electrical) or preferably qualifications equivalent to Grad. I.E.E., and have had experience of erection of H.V. substations and steel tower overhead lines.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 27th November, 1958. 5419

ESSO PETROLEUM CO. LIMITED

Esso Refinery
Fawley, Nr. Southampton

ESSO PETROLEUM Company Ltd. have vacancies on their staff for an ELECTRICAL PROJECTS ENGINEER and an INSTRUMENTS PROJECTS ENGINEER. Candidates should be graduates or of graduate status and experience in the petroleum or allied industries would be an advantage.

There is an excellent pension scheme and recreational facilities of all kinds are available in a pleasant rural area bordering Southampton Water.

Applications, which will be considered in strict confidence, should be addressed to the Employee Relations Superintendent at the above address. 5377

ELECTRICAL CONTRACTING ESTIMATOR

required by well-known organisation for their London office; essential to have previous experience in the pricing of schedules for large Government contracts, public works and city blocks. Excellent opportunities of promotion in rapidly growing office; generous salary with superannuation. Assistance with removal expenses and house purchase where necessary. Apply stating age, apprenticeship and subsequent training and experience to—Box 5476.

LAMINATED BAKELITE

FIRST-class person required to control and develop the manufacture of the above material. Good salary to suitable applicant; must be conversant with this product, and possess initiative and drive.

All replies treated in strictest confidence.

H. CLARKE & CO. (MANCHESTER) LTD.
Atlas Works
Patricroft, Nr. Manchester 5435

Situations Vacant (continued)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

SHIFT CHARGE ENGINEER is required at Nechells "A" Power Station, Birmingham. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade G7, £935-£995 per annum, plus 10% shift allowance.

A sound technical training and practical experience in the operation and maintenance of steam generating plant and main switchgear are required. Knowledge of pulverised fuel firing would be an advantage. Appropriate qualifications desirable.

Apply quoting vacancy number 890MD on form AE6 available from the Establishments Officer, 53, Wake Green Road, Moseley, Birmingham, 13, by 1st December, 1958. 5466

THE ELECTRICITY COUNCIL

Principal Assistant

THE ELECTRICITY COUNCIL require a PRINCIPAL ASSISTANT in the EDUCATION and TRAINING BRANCH in London. Duties include some of the following: Careers publicity; drafting of policy concerned with the education and training of personnel in the electricity supply industry; planning of training courses; preparation of reports and committee work. Candidates should have a high standard of literary ability and a science or arts degree would be an advantage.

Salary within N.J.C. Grade 7, £1,120-£1,210 p.a. inclusive.

Applications stating age, present salary and giving details of qualifications and experience to E. Landucci, Winsley Street, London, W.1, to arrive not later than 28th November, 1958. Quote ref. C/22. 5462

CENTRAL ELECTRICITY GENERATING BOARD

INSTRUMENT ENGINEER FOR BERKELEY NUCLEAR POWER STATION

CANDIDATES should have a good technical and theoretical background and considerable experience in instrument work; a knowledge of electronic techniques would be an advantage. Prior to taking up appointment at Berkeley the successful candidate will receive appropriate training for about 10 months.

Salary within range £1,435-£1,540 p.a.

Applications stating age, qualifications, experience, present position and salary should be forwarded to I. G. Ellis, Personnel Officer, 24-30, Holborn, London, E.C.1, by 21st November.

Please mark envelope "Confidential, ref. E.R./275A." 5463

ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL

AN apprenticed or similarly trained TECHNICAL OFFICER is required to assist a senior engineer in the preparation of cost estimates of mechanical and electrical components from engineering drawings. The post involves liaison with scientists and engineers.

Engineering "know how" and an acceptable personality are as important as estimating experience.

Salary £1,050-£1,270 (Technical I).

Housing and superannuation schemes.

Please send a POSTCARD to the Group Recruitment Officer (1266/48), U.K.A.E.A., A.E.R.E., Harwell, Berks., for details. 5415

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

DISTRICT ENGINEER required in the Crewe District of the Board's No. 4 Sub-Area. Salary within range £1,160/£1,235 per annum (N.J.B. F/3).

Applicants should have experience of the construction and operation of distribution systems, and a knowledge of technical and economic features in system layout and design.

Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date 2nd December, 1958. 5459

BOROUGH OF CHESTERFIELD

Street Lighting Technical Assistant

APPLICATIONS invited from suitably qualified persons for above appointment in Department of the Borough Surveyor. Salary scale Grade A.P.T. III, commencing according to qualifications and experience. Car allowance available.

In addition to the duties of street lighting the person appointed will be responsible to the Borough Surveyor for other ancillary matters, including traffic signs, etc.

Particulars from the Borough Surveyor, Town Hall, Chesterfield, to whom applications, together with names of two referees, must be forwarded not later than Wednesday, 19th November, 1958.

Canvassing will disqualify.

RICHARD CLEGG,
Town Clerk.

3rd November, 1958. 5445

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

STATION SHIFT CONTROL ENGINEER is required at Meaford "A" Power Station. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade G.10, £790-£835 per annum plus 10% shift allowance.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualifications an advantage.

Apply, quoting Vacancy No. 886MD, on form AE6, available from the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 27th November, 1958. 5429

GOVERNMENT OF THE FEDERATION OF RHODESIA AND NYASALAND

APPLICATIONS are invited for the post of LABORATORY TECHNICIAN at the Salisbury Polytechnic, Southern Rhodesia.

Applicants should hold the minimum qualification in Laboratory Technician's Intermediate Certificate of the City and Guilds of London Institute, or its equivalent, in Electrical Engineering, Mechanical Engineering, or Physics.

The grade applicable to such a qualification would be Scientific and Technical Grade IV on the scale £420-£1,370, previous experience being taken into account when assessing the commencing salary.

Application forms and further details from Secretary (R), Rhodesia House, 429, Strand, London, W.C.2. Closing date 30th November, 1958. 5430

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division
(Vacancy No. 119/ER/58)

APPLICATIONS invited for superannuable N.J.B. appointment of ASSISTANT SHIFT CHARGE ENGINEER at UPPER BOAT POWER STATION, PONTYPRIDD.

Salary, H.9, £885-£930 per annum.

Operating experience in a generating station essential; appropriate engineering qualifications and regular apprenticeship desirable.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 27th November, 1958. 5468

DRAUGHTSMEN

SENIOR ENGINEERING DRAUGHTSMEN required in our works plant engineering and maintenance department. Applicants, aged 28 or over, should hold H.N.C. or equivalent in one of the following:—

MECHANICAL.
ELECTRICAL.
BUILDING.

Apprenticeship and 5 years' subsequent workshop experience desirable plus originality and flair for design.

Write in confidence with full details to—Siemens Edison Swan Ltd., Ref. 744/33, Woolwich, London, S.E.18. 208

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

THIRD ASSISTANT ENGINEER required in the Technical Department, Bristol Area. Superannuation scheme. Salary N.J.B. Class AX/DX, Grade 6, £895-£1,020/£1,110 per annum.

Applicants should have had a good general and technical education and have wide experience in testing, commissioning and maintaining protective and control equipment in generating and transmission stations. Organising ability and a university degree would be an advantage.

Applications on Form A.E.6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 22nd November, 1958. 5467

ELECTRICAL ENGINEER

wanted by leading German manufacturer for German-English translations. Applications are invited from British-trained engineers with a good general education and sound technical training, preferably also with practical experience in the application of electric equipment. Good working knowledge of German is essential. The ability to write clearly and concisely will be expected of candidates.

A five-day week is worked with generous holidays. Favourable housing conditions for permanent staff.

Apply, stating age, education, qualifications, experience and salary required, to—Box 5365.

A C.M.A. FIRM NEAR LONDON

offers two excellent positions:—

(a) JUNIOR TECHNICAL ASSISTANT for the Cable Division. O.N.C. in Electrical Engineering desirable but not essential.

(b) ESTIMATING CLERK of high standard for Cable Sales Department. Previous experience of estimating essential.

Apply, giving details of previous experience and salary required, to—Box 5423.

SIMPSON BROTHERS (OF HAPTON) LTD.

have vacancies for the following:

ELECTRICAL ENGINEER to develop existing special products section. Opportunity for young man with technical qualifications.

BUYER/STOCK CONTROLLER. Must have experience of electrical industry.

Apply by letter—Simpson Brothers (of Hapton) Ltd., Hapton, near Burnley, Lancs. 5433

ELECTRICAL INDUSTRIAL HEATING

DESIGNING ELECTRICAL ENGINEER-TECHNICIAN-DRAUGHTSMAN required to assist director with development of heaters and elements and works management. Progressive opening throughout for keen young man with small progressive engineers, outskirts S.W. LONDON. Please write stating age, experience and present salary.—Box 5378.

ACCOUNTS clerk, age 21-25, required by established electrical contractors, London, S.W.1. Preferably some knowledge of trade, costing and preparation of contractors' bills. Good opportunity for keen young man. Write, giving experience, age and salary required, to—Box 5421.

AGENTS for well-known continental electrical engineering firm are looking for one or two technical assistants in their sales department. Applicants should have knowledge of technical German and be able to read the language. Speaking or writing is not required. Age between 25 and about 40 years. Write with full details of education (H.N.C.) and experience to—Box 5475.

ASSISTANT draughtsmen, experienced, for lighting and power schemes for hospital, office and school buildings, also specifications. Annual bonus, five-day week and 3 weeks' holiday. Consulting engineers, Holborn (London) area.—Box 5284.

ASSISTANT electrical engineer. Electric motor control gear manufacturers require young assistant in design office with knowledge of electronics. Progressive position, contributory pension scheme.—Box 5246.

ASSISTANT works manager required. Must be conversant with electric lamp manufacture. Also vacancy for foreman with knowledge of sealing, stem making or pumping. Replies treated in strictest confidence.—Luxram Electric Limited, Knight Road, Strood, Kent. 9542

AUTOPHONE Ltd. require telecommunications engineer capable of assisting in developing automatic and loudspeaking telephone equipment. Ability to write technical descriptions desirable. Good salary, prospects and working conditions. Write with brief details to—Autophone Ltd., 539, Wandsworth Road, London, S.W.8. 5367

CABLE development engineer with power cable experience required to take charge of cable and process development in medium-sized company. This senior appointment offers considerable scope to an engineer able to initiate and carry out successfully development projects. Applications giving full particulars, including age, training and experience, should be addressed to—Box 5412.

C.M.A. cable company near London has a vacancy for a general sales manager. Knowledge of all types of cables essential. Salary in accordance with experience. Contributory pension scheme.—Box 5399.

C.M.A. cable works near London manufacturing paper, rubber and plastic cables require technical order clerk. Ordinary Nat. Cert. would be an advantage. Previous experience essential. Salary in accordance with experience. Contributory pension scheme.—Box 5368.

DEPARTMENT OF HEALTH FOR SCOTLAND. Clerk of works, engineering. Pensionable post for man at least 25 on 1.10.58. Qualifications: 5 years' apprenticeship plus 3 years' experience in engineering trade; experience in maintaining steam plant, heating and electrical installations. National Certificate in Mechanical or Electrical Engineering or M.T.C.A. Certificates (Steam) an advantage. Salary £720 (at age 25) to £845 (30 or over) rising to £1,002. Write Establishments Officer, Department of Health for Scotland (Room 30), St. Andrew's House, Edinburgh, 1, for application form. Closing date 12th December, 1958. 5478

DESIGNER draughtsman. Due to expansion, opening occurs for better than average engineer to join enterprising and enthusiastic team in design, pricing and site execution of electrical installations for all classes of buildings. Creative mind and accuracy essential for this interesting and high calibre work. Write full particulars of experience, age, training and salary required—(M.D.), Alliance Electrical Co. Ltd., 2, Henrietta Street, London, W.C.2. 65

DRAUGHTSMAN, senior electrical, required by leading electrical contractors, London, S.W. Experienced in preparing installation layout and record drawings, builders' holes details, connection diagrams, etc. Knowledge of installation design advantageous. Two junior draughtsmen already employed. Five-day week. Please state in confidence age, experience and salary required to—Secretary, Box 5480.

ELECTRICAL and radio distributor has vacancies for progressive men aged 25/45, capable of accepting responsibility and with comprehensive knowledge of all aspects of electrical wholesaling. Apply in first instance stating age and full details of experience to Managing Director, The Wholesale Fittings Co. Ltd., 46/52, Commercial St., London, E.1. 5355

ELECTRICAL draughtsman required for consultants' office to work on preparation of electrical design drawings and specifications for power and lighting installations, covering all types of commercial and industrial buildings. Site visits and opportunity for early advancement to engineer status. Good commencing salary. Please apply in writing stating age, experience and salary expected to—A. F. Myers & Partners, 147, Victoria Street, London, S.W.1. 5449

ELECTRICAL engineer required at the Northern Outfall Works, Beckton, London, E.6, to assist in supervising the erection and commissioning of H.V. and M.V. plant including switchgear, transformers, alternators (three 770 kWs, 3.3 kV), cabling, and a comprehensive lighting, heating and power installation. Salary up to £900 p.a. according to qualifications and experience. Application form from Chief Engineer (58/98), London County Council, County Hall, London, S.E.1. (2193) 5450

ESTIMATING and assistant engineer, with experience in contractor's office.—Tucker Bros., Electrical Engineers Ltd., 32, Station Lane, Hornchurch, Essex. 9539

ELECTRICAL, mechanical engineer/draughtsman, experienced in estimating and supervising manufacture of electrical equipment for the printing trade. Knowledge of costing an advantage. N.W. London. Apply giving full details of experience and state salary required to—Box 5370.

ESTIMATING engineer. Experience of motor control gear, sequence, auto control and ancillary gear essential. Opportunity for man with experience and ability; pension scheme; 5-day week. Applicants should supply details of experience and present salary to the Managing Director, British Klockner Switchgear Ltd., Chertsey, Surrey. 5413

ESTIMATOR/supervisor for good-class contracts; accom. available. Write—Russell's, Queens Road, Watford. 5479

EXPERIENCED draughtsman required by South London motor and geared motor manufacturers.—Box 5451.

IF you reside in the London area, have technical experience in medium-voltage airbreak switch and distribution gear, are 35 to 40 years of age, with experience and contacts with electrical consultants and architects, and are interested in joining a well-known manufacturer's sales staff to work from London office as a technical representative, there is a very interesting position available. Write to—Box 5289.

INDUSTRIAL electrical installation manager. Applications are invited for this position in expanding company well established in the engineering field. Applicant must possess technical qualifications, experience in installation office organisation and sales promotion. Details of experience, age and present salary. Reply with full details to—Box 5452.

INSTALLATION estimator-designer engineer for old-established electrical contractor handling large commercial, municipal and industrial schemes. Location West London. Interesting prospects for well qualified, experienced and capable man. Please give comprehensive personal information, in guaranteed confidence, to Managing Director.—Box 5488.

JUNIOR estimator required for large electrical contractors, S.W. London. Experience of large housing and flat installations essential. 5-day week. Full details age, experience and salary required to—Box 5453.

LEADING East African merchants require sales manager to be responsible for the development of business in domestic radio receivers and allied lines. While the main need is for a man with a flair for selling and with a good record in this field, servicing experience is essential as it will be necessary to establish and supervise service depots. Commencing salary not less than £1,500 per annum. Contributory pension fund and medical expenses scheme, partially furnished accommodation or allowance in lieu thereof, and free passages for employee and family. Optional tours of two or four years' duration with U.K. leave on full pay.—Box 5414.

LONDON E.W.F. wholesaler requires representative with ambition and preferably connection with contractors and industrial users in London, N.W. area. State experience, details and salary required to—Box 9536.

OVERHEAD foremen and linesmen wanted for pole work up to 33 kV. Good hours, permanent position, London rate for right people.—Box 5177.

SENIOR draughtsmen required in West Country. Must have design experience of either components such as contactors, relays, etc., or of complete automatic control and/or switchgear installations. Knowledge of the requirements of the British Admiralty or of Lloyds, etc., for marine equipment an advantage. Pay in accordance with experience but above A.E.S.D. minimum. Good and congenial working conditions; varied and interesting work. Apply in confidence—Box 5454.

STOREKEEPER. Must be thoroughly experienced and only those who have worked for an electrical wholesale company for many years need apply. Applications by letter only stating full details.—Halsey's Electric Co. Ltd., Brandon House, Wyfold Road, Fulham, London, S.W.6. 5179

TRANSFORMER engineer required by the British Electric Transformer Co. Ltd. for tendering and technical correspondence. Applicants must be fully experienced in this class of work and should be educated up to H.N.C. standard. Full particulars of age, experience and salary required to the Personnel Officer, The British Electric Transformer Co. Ltd., Hayes, Middx. 5345

WANTED for large estate, electrician-engineer for maintenance of electrical installations, boilers and general maintenance. Apply stating experience and with references—Estate Office, Houghton, King's Lynn, Norfolk. 9540

YOUNG engineer is required by a contracting firm operating in South and East England. Applicants should have some experience of the supervision of high and low-voltage cable laying and jointing, and switchgear erection. The applicant will have the opportunity of furthering his experience in the above field and also in that of estimating for large and varied projects.—Box 5265.

APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

SITUATIONS WANTED

ADVERTISER, many years with well-known London electrical contractors, desires change. Extensive administrative experience in all branches including staff control. Only progressive post with good remuneration considered.—Box 9523.

ELECTRICAL and mechanical engineer, erection and running diesel power stations and networks up to 11 kV, ten years Middle East, available end of year, desires overseas position. Married, age 43. English.—Box 9525.

ELECTRICAL engineer, experienced in running diesel stations and distribution systems up to 33 kV, desires further senior position overseas.—Box 9529.

ELECTRICAL engineer, Grad. I.E.E., Grad. I.Mech.E., seeks change from design engineer consultants to technical sales engineer. Experienced in dealing with clients, architects and contractors.—Box 9532.

ELECTRICIAN completed contract in Africa as supervisor seeks post overseas. Very keen.—Box 9538.

EST./supervising engr. desires change, pref. Southern area. Fully exp. contracts, enquiry to final acct. including sales. Progressive position essential.—Box 9522.

EXPERIENCED sales engineer, age 40 years, 26 years electrical trade, seeks change as sales manager or senior sales engineer. Excellent connections Govt. dept. boards, public bodies, big users, wholesalers.—Box 9517.

SALES representative, experience and qualifications domestic appliances, sound connection electrical boards, wholesalers, contractors, good turnover, car, phone, requires appointment.—Box 9541.

TECHNICAL representative, A.M.I.E.E., age 36 years, seeks sales management post or position as at present but arranged to eventually lead to executive appointment.—Box 9533.

ARTICLES FOR SALE

Newman

ONE new 1949 ENGLISH ELECTRIC Model 8RL Vertical Diesel Engine only, 1,000/1,144 b.h.p., 375/428 r.p.m., 800 kVA, 428 r.p.m.. Alternator and switchgear available.

TWO new 1950, 493-kVA PETTER/BRUSH Diesel-driven Alternator Sets. 600 r.p.m.. 400/3/50 cycles, 4-wire output, with switchgear.

TWO new 1948, 236-kVA CHICAGO PNEUMATIC/L.D. & C. Diesel-driven Alternator Sets, 600 r.p.m. for 400/3/50 cycles, 4-wire output, with switchboards and synchronising panel.

ONE 220-kVA GENERAL MOTORS Model 8/268 Diesel-driven Alternator Set, 1.000 r.p.m. for 415/3/50 cycles, 4-wire output, with switchgear.

ONE 62½-kVA PAXMAN Model 5RW Diesel Alternator Set, 1.000 r.p.m. for 400/3/50 cycles, 4-wire output, with switchgear.

ONE 110-h.p., 350-r.p.m. CROSSLEY twin-cylinder vertical Diesel Engine only, Model RVD2, with shaft extension and outer pedestal bearing.

All available for early despatch.

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Yate, Bristol
(Telephone: Chipping Sodbury 3311)
5291

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100 CONCRETE UTILITIES 2D 15-ft. Lamp Standards with 18" and 30" outreach brackets.
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600 Admiralty Patt. Lightning Conductor Clamps.
30 GRESHAM H.T. Oil-filled Transformers, 230/1/50, output 8,000 v. at 4.3 kVA. Wt. 2½ cwts.
5 BUTCHER Earth Protected Transformers, 440/350 volts, 4 kVA.
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1200 ft. of 1" Gas Galv. Wrought Iron Conduit, 20-ft. lengths.

(All above Below Works Cost)

CITY & CONTINENTAL TRADING CO.
4, Dock Street, London, E.4
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CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

DISPOSAL OF PLANT

TENDERS are invited for the following plant :—

Exeter Power Station

1 24.5-k/lb./hr. BABCOCK & WILCOX Chain Grate Water Tube Boiler (1923), 200 lb. p.s.i., 588° F., and associated valves and pipework.

Newton Abbot Power Station

4 25-k/lb./hr. STIRLING Chain Grate Water Tube Boilers (1924/5), 165 lb. p.s.i., 540° F., and associated valves and pipework.

Tender forms and conditions of sale, together with arrangements for inspection, obtainable from the Divisional Secretary, Central Electricity Generating Board, South Western Division, 26, Oakfield Road, Bristol, 8.

Tenders must be submitted by 5th December, 1958. 5436

ELECTRICAL EQUIPMENT FOR SALE

10-kVA/10-h.p. D.C. and A.C. School or Laboratory Test Set. Output 25 to 60 cycles and 150/500 volts D.C.
Reconditioned Motors.
3-kVA, 230-volt, 1,000/1,100-cycle M.G. Set.
Diesel Alternator Sets.
562-kVA, 300-r.p.m. Alternator, 400/440/3/50 cycles.
Secondhand 5-cwt. Electric Blocks.

SOUTHERN & REDFERN LTD.
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VARIABLE SPEED MOTORS

500 volts D.C., with Control Gear

One	60 h.p.	480/1450	r.p.m.
One	45 "	850/1430	"
One	40 "	950/1120	"
Six	35 "	480/1450	"
One	35 "	900/2000	"
One	30 "	500/1500	"
Twelve	25 "	850/1420	"

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480, Pollokshaws Road, Glasgow, S.1
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SMOOTHED A.C. to D.C. RECTIFICATION

COMPLETE range of smoothed transformer rectifier units with choke condenser filtering giving low ripple content.

Short deliveries from standard range, up to 60 volts and 50 amps.

Further details on request against specific requirements.

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ELECTRIC HOUSE SERVICE METERS

PREPAYMENT and credit, 200/250 v. A.C., s/p., 50 c., 2½-100 A. Fixed or variable tariff. Reconditioned, fully tested and guaranteed 2 years. Prompt delivery, carriage paid.

ALBERICE METER COMPANY
Fairfax Works, Fairfax Rd., London, N.8
(Tel. MOUntview 7944, 6373) 191

350-h.p. INDUCTION MOTOR

OFFERS are invited for one MATHER & PLATT 350-h.p., 400-volt, 3-phase, 50-cycle Induction Motor, with ALLEN WEST Starter, B.I. Condenser and CANTIE Isolator. Inspect at Thomas Taylor & Brother Ltd., Victoria Mills, Wallgate, Wigan, Lancs. 5455

HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.
221, City Road, London, E.C.1 37

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd., London W.4. 57

A BABCOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

A.C. and D.C. 1/- slotmeters. Guaranteed 2 years, 2½-50 amps. From 50/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 4487). 169

ALTERNATORS from ½ to 675 kVA in stock, single and three-phase, all voltages and frequencies. Guaranteed. Many unused. Send your requirements.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

ALTERNATORS, generators, 1-588 kVA, all voltages. Specialists—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 147

ALTERNATORS, 3-phase, all sizes in stock from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 20/26, Britannia Walk, London, N.1 (CLErkenwell 5512). 24

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

BILLIARD Meters. 1/-, 6d. or 1d. slot. All time settings. From 140/-. See Quarterly.—Tradex, Surbiton. 170

CABLE, underground, all types ex stock.—E. M. Tatton Co., Ltd., Kew Bridge, Brentford (EALing 3155/6). 117

CABLE, underground, PILC/VIR/LC, ex London stock. Cutting orders same day delivery London area. Send for priced stock lists. — Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYal 5905). 316

CIRCUIT breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards. — Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS and motor-alternators, 24, 110 and 220 v. D.C. to 230/1/50 A.C., 300 watts to 6 kVA in stock.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

COPPER winding wire, enamelled, etc., in most sizes; redundant stock; willing to dispose in split lots at 10% off list price.—Rex Equipment Co., 269, Rye Lane, Peckham, London, S.E.15 (New Cross 2535). 5483

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DIESEL electrical generating sets, arranged to start on mains failure or remote starting. Many sizes in stock from 5 kVA to 87.5 kVA. Unused. Guaranteed. Heavy duty gear especially suitable for hospital and similar installations.—Fyfe, Wilson & Co. Ltd., Station Works. Bishop's Stortford. 5485

DIESEL generating sets, all sizes to 500 kW. Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

ELECTRIC motors, generators, control gear, transformers, A.C. and D.C., new and reconditioned; all covered with our usual 12 months' guarantee; large stocks available.—Electropower Co. Ltd., Kingsbury Works, Kingsbury Road, London, N.W.9 (Colindale 4621-2). 42

ELECTRIC motors, generators, motor generator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

ELECTRICIANS. Send for details Shaftesbury lightweight "Bantam" ladders. Top sections fitted with patent moulded rubber blocks, eliminate possibility of scratching or marking walls, fascias, and other painted or highly polished surfaces. Also available for immediate delivery, steps, platform steps, trestles, telescopic trestles, pole and builders-type ladders, and all sizes of two and three-section extension ladders.—Shaftesbury Ladders Ltd. (E.R.), 453, Katherine Road, London, E.7 (Phone: Grangewood 3363/4). 111

FLUORESCENT fittings, lamps, starters and control gear for home and export. Fully guaranteed by actual manufacturers. Send for catalogues. — The Anglo-American Electrical Company, Olive Street, Bury, Lancs. 245

FLUORESCENT tubes reconditioned and guaranteed as new for 7s. 6d. each. Free collection and delivery in Lancs and Yorks.—The Anglo-American Electrical Company, Bury New Road, Breightmet, Bolton, Lancs. (Telephone, Bolton 7251). 212

FOR immediate sale, the following D.C. 440-480-volt motors : one 350 h.p., 235 r.p.m.; one 300 h.p., 222-250 r.p.m.; one 500 h.p., 245 r.p.m. For inspection write—Box 5426.

FOR sale, mercury arc rectifier, maker Hackbridge-Hewittic, input 400 volts, 3-phase, 50 cycles, output 230 volts D.C., 80 kW. B.T.H. variable speed commutator motor, 400 volts, 3-phase, 50 cycles, 40/8 h.p., speed 1,150/230 r.p.m.—Box 5405.

FOR sale, motor generator, rotary converter and Ward Leonard sets in a great range of outputs, speeds and control systems.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 161

FOR sale, number of petrol-driven welding sets, 250 amps., Meadows engines, Mawdsley generators. Excellent condition, cheap.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 5486

FOUR 575-h.p., 490-r.p.m., 3,000-volt, 3-phase, 50-cycle, B.T.H. squirrel cage, totally enclosed vertical motors.—A.A. Electrical Co. Ltd., 67, Rothschild Road, Chiswick Park, London, W.4 (Chiswick 5105). 5424

FRACTIONAL h.p. synchronous motors, single-phase, 1,500 r.p.m., 4-pole, single or 3-phase, on skeleton frame, ex stock. Useful for medical, electronic or sign equipment, etc.—Rex Equipment Co., 269, Rye Lane, Peckham, London, S.E.15 (New Cross 2535). 5482

FREQUENCY changers and variable frequency M/A sets in stock, and to specification.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 148

GENERATING plants of all types, new and reconditioned up to 100 kVA in stock. Special plants built to order at short notice; automatic mains failure, etc. — Powerco Ltd., 312, York Rd., London S.W.18 (VAN. 5234). 151

GENERATING sets for sale, petrol, diesel and steam, from 1 kW up to 700 kW, A.C. and D.C. switchboards.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 163

HIGH frequency alternators and converters, 400 to 2,600 cycles up to 6 kVA in stock. Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 149

MOTOR generator sets and converters, all sizes and voltages from ½ kW up to 500 kW in stock. — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

MOTOR generators of all types in stock and to specification up to approx. 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 152

MOTORS and control gear, huge stocks all types, ½ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (3774/5/6). 70

NAMEPLATES, engraving, diesinking, stencils. — Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

PHASE converters, single to three-phase, several sizes in stock up to 90 h.p., 3-phase loading. — Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

PLATING dynamos and motor generator sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

POLYPHASE kilowatt hour meters. Available from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

PREPAYMENT 1s. slot house service meters. —Universal Electrical, 217-221, City Road, London, E.C.1. 36

PURLEY chokes and ballasts. Our 80-w. tapped h.p.f. ballast with starter switchholder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject. — F. F. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

QUARTERLY credit meters, single and polyphase, 2½-100 amps. From 17/6d. Also D.C. See Television.—Tradex, Surbiton. 171

RECTIFIER, 40-kW Hewittic, 400/3/50, input 460 volts D.C., output 87 amps., bulb type, fan cooled, with outgoing D.C. circuit breaker, complete transformer. Two at £175 each.—C. M. Hartshorne & Co. Ltd., Standard Eng. Wks., Meltham, nr. Huddersfield (Tel. Meltham 537). 9519

ROTARY converters in stock, all sizes; enquiries invited. — Universal Electrical, 221, City Road, London, E.C.1. 34

SECONDHAND electrical plant can be as good as new if you buy it from specialists. Write for our stock list.—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park, Middlesex (Telephone, Wembley 3121); Soho Road, Handsworth, Birmingham (Telephone, Birmingham Northern 0898). 73

SLYDLOK fuses for sale.—Ryness Supplies, 37, Goodge Street, London, W.1. 284

SMALL BR screws and nuts in steel, brass and stainless steel, from stock.—Premier Screws & Repetition Co. Ltd., Woodgate, Leicester. 180

TELEVISION slotmeters and time switches. Details from: Tradex Meter Co., Surbiton. Elmbridge 4487. 172

TIME switches from stock. Reconditioned or new. 12 months' guarantee. Lists from—J. W. Hughes, 3, St. Thomas Street, London Bridge, London, S.E.1 (Tel. HOP 2759). 178

TRANSFORMER by Hackbridge, 30 kVA, primary 400 v./3/50, 43 amps., sec. 110 volts, 1-ph., 50 c., 273 amps., Ser. No. 42305, with ammeter, £35 (o.n.o.).—Drake & Fletcher Ltd., Maidstone, Kent (Ref. AW/ELEC). 5425

VENNER time switches, 200-240 v. A.C./D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

WARD Leonard motor generating sets, all sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

1 Polyphase meter (400-440 v., 3-phase), Ferranti, 200 kVA max. demand time period = 30 mins. Complete with current transformers. Barron Electrical Co. Ltd., 8, Castle Hill Parade, The Avenue, London, W.13. 5381

300-kVA indoor power transformer, 3-phase, 50 cycles, 6,600/400 volts, delta/star connected, complete with Statter L.V. switchboard comprising one 1,000-amp., one 600-amp., one 500-amp., four 300-amp. O.C.B.s and instrumentation. No reasonable offer refused.—British Indestructo Glass, Park Royal Road, London, N.W.10 (Tel. No. ELGar 7761). 5437

400-kW, 220/230-volt D.C. rotary converter with 6,600-volt, 3-phase, 50-cycle transformer, H.T. switch, starting and control panels. Inspection on site invited. Offers to—Box 5438.

500-kW, 220-volt Met.-Vick. rotary converter, with transformer 11,000 volts, 3-phase, 50 cycles, and accessories.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 17

600-ampere Met.-Vic. oil circuit breakers, T.P., 400/3/50, cubicle type, volt and ammeter, etc. Several at £75 each.—C. M. Hartshorne & Co. Ltd., Standard Eng. Wks., Meltham, nr. Huddersfield (Phone, Meltham 537). 9520

400-cycle to 1,500-cycle motor alternators and alternators.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 27

EQUIPMENT FOR HIRE

GENERATING set hire service. Consult the most experienced firm for A.C. and D.C. units from 2 kW to 240 kW, diesel or petrol, stationary or mobile, sale or hire. 24-hr. breakdown service. — Dawson-Keith Ltd., Hillview Rd., Sutton, Surrey (Fairlands 4401). 46

RELIABLE, self-contained diesel electric generating sets for hire, 2.5 to 260 kW. Night and day maintenance service. Quotations by return. — Whitetrade Limited, Rochester, Kent (Tel. Chatham 41133, 3 lines). 294

ARTICLES WANTED

HARRINGTON & Sons, reclamation contractors, want redundant A.C./D.C. electric motors and transformers, stocks of cable, etc.—109, Beaconsfield Street, New Beckton, East Ham, London, E.6 (ALB. 1388). 315

MERCURY (Quicksilver) wanted. Write for packing instructions. Gold, silver and platinum also purchased.—Collingridge & Co. Ltd., Riverside Works, Riverside Rd., Watford (Tel. 5963). 114

QUICKSILVER & beryllium copper urgently required for best prices and prompt cash.—Sterling Products Ltd. (Ealing 9248). 293

SURPLUS laminations, enamel copper wire, screws, nuts, flex. Good prices paid. Full details to—Box 199.

WANTED, D.C. and A.C. ball-bearing motors, motor generator sets, dynamos and alternators. Full details to — Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1. 13

WANTED for prompt cash, ferrous and non-ferrous scrap, also plant for dismantling. Buyers of secondhand machinery and plant for re-use.—W. & H. Cooper Ltd., 176, Brady St., Bethnal Green, London, E.1. 120

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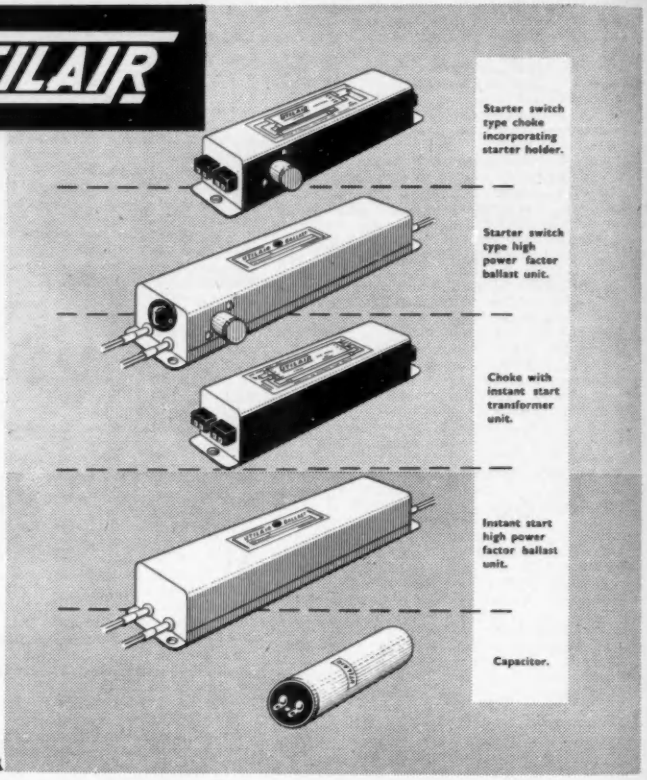
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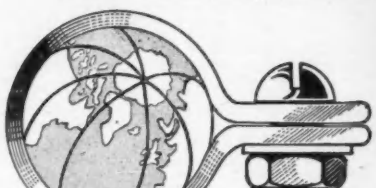

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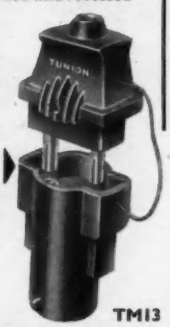

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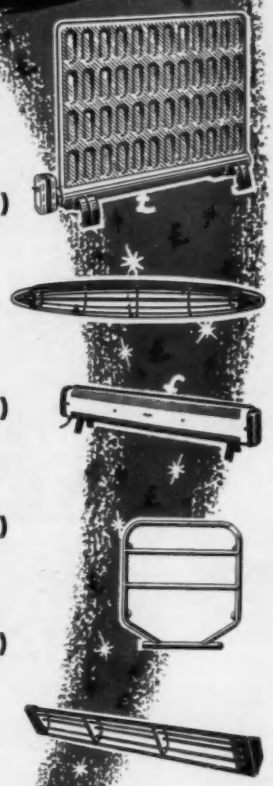

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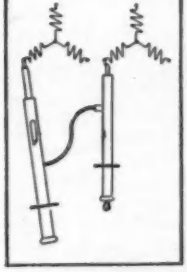

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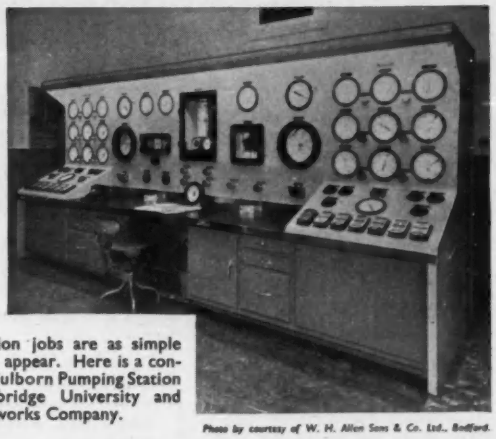

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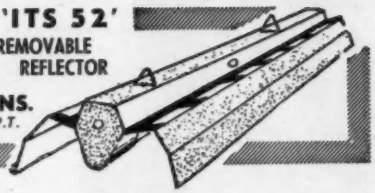

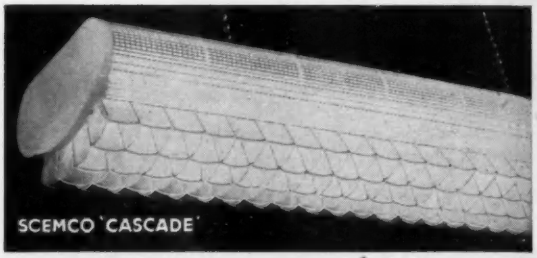

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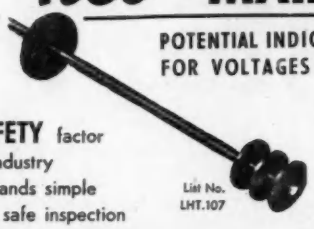

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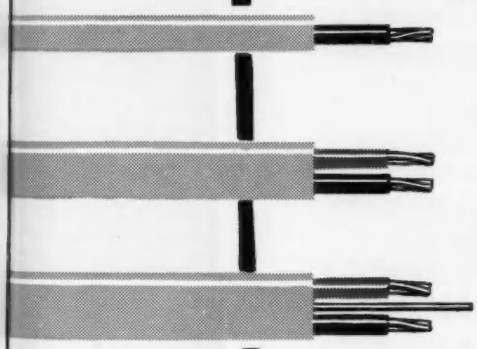

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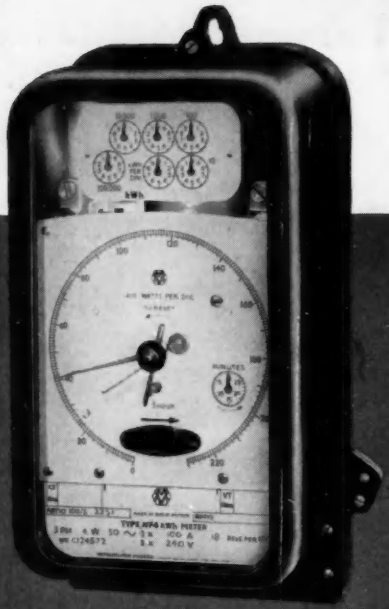
The type NF3 (two-element) and NF4 (three-element) watt-hour and maximum demand meters have been designed to meet present day requirements for overall accuracy. Their easily accessible adjustments, lightweight construction and handsome appearance, will commend themselves to all users. The meters comply in all respects with British Standard 37: Part 4: 1954 and Part 5: 1955.

Type NF3 two-element watt-hour meter



Type NF4 three-element maximum demand meter

For further information please write for 'The Art of Metering', which gives full details of these meters.

METROPOLITAN-VICKERS
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LEADING METERING PROGRESS

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